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EDITORIALS

AMERICA'S ELECTRICAL WEEK.

Today marks the inauguration of America's Electrical Week, the second national effort made by the electrical industry to focus attention upon itself and to call the attention of the public to the diversified applications and the manifest advantages of electrical energy and electrical devices. America's Electrical Week will be celebrated from December 2 to December 9 in all parts of the country and a great deal of work has been done by the officials of the Society for Electrical Development, and by the local committees everywhere, to make it a success. The movement this year is more a national movement than was Electrical Prosperity Week in 1915, more cities have planned celebrations and campaigns, and it is receiving more attention outside of the immediate confines of the electrical industry itself. The week will be inaugurated today by the participation of the President of the United States in the electric lighting of the Bartholdi Statue of Liberty in New York Harbor, which is one of the features of this national celebration.

The week comes at a time when manufacturers are not seeking orders and when additional demands upon their output are more likely to prove embarassing than comforting. Support of the movement comes consequently not from a narrow and selfish regard for the immediate acquisition of new business, but from that broader outlook which sees in the present stimulus to the purchase of electrical goods and the use of electrical energy a widening and expanding influence which will be felt by the industry in the years to come.

It is hard to gauge the importance to the industry of organized movements such as are represented by America's Electrical Week, but there can be no doubt that they do a great deal to stimulate the use by the public of the greatest servant which it has available in simplifying and making more easy the work of the world. At this time of general prosperity the volume of electrical Christmas buying will be greatly increased, but more than that, the interest now directed toward things electrical will bear fruit in future years, and will stimulate electrical sales months and years after the week has been forgotten. All elements of the industry should take a hand in making the week of the utmost utility in every way and thus contributing to a success which will redound to the benefit of every element in the industry.

CONTROLLED FLAT RATE ON TRIAL.

It has often been pointed out that the expense of providing service to small consumers of electricity would be considerably reduced by omitting the meter, which involves expense for interest, maintenance, depreciation, reading and accounting, and supplying such consumers at a flat rate. To protect the electric company from a greater use of energy than is contemplated by the specified flat rate, a flat-rate controller which limits the amount of current used has been used in this connection. Its function is to interrupt the current when the attempt is made to use more than the specified amount and the resultant flickering of lights prevents the satisfactory use of more than the specified number or wattage of lamps on the circuit. It has frequently been questioned whether this form of rate would meet with the approval of public service commissions, although it has already been used in a large number of communities.

The matter was brought before the State Public Utilities Commission of Illinois by the Central Illinois Public Service Company, which proposed to establish a controlled flat rate of $1.00 per month for lighting service in certain municipalities of its district. The Commission approved of the application of this rate for a trial period of 18 months under the provision that watt-hour meters will be installed to measure the energy taken by a few typical customers, so that a check may be obtained upon the reasonableness of the rate. The contract provides for limiting the service to 100 watts, to be used through not more than seven sockets and only in tungsten lamps. No other current-consuming device is to be connected without the consent of the company and payment is to be made monthly in advance. If payment is not made by the sixth day of any month, service is to be discontinued without notice.

The company has found the rate satisfactory heretofore in other districts of its territory, and it has been an aid in securing residence lighting customers. The territory includes a large number of small towns in the coal fields and oil fields where the lighting of small residences has not developed satisfactorily under meter rates. It has been found that the average rate per kilowatt-hour under the controlled flat rate is about the same as the meter rate in effect in the same districts. It is consequently to be anticipated that the consent of the Commission will be extended beyond the trial period and eventually made permanent.

MICA INSULATION.

In all fields of human endeavor and relationships it is noticeable that practice lags behind knowledge and that both thought and action lag behind ideals. This is well illustrated in the attitude, especially among operating engineers, as to the permissible temperatures which should be allowed in large generators built with mica insulation. At a meeting of the American Institute of Electrical Engineers held in New York City in November, 1915, it was pointed out in a paper by Mr. F. D. Newbury that machines with this type of insulation have been operated at temperatures as high as 200 degrees centigrade without injury, and that it would be entirely reasonable to regularly operate them at 150 degrees. The discussion of this paper brought out very little opposition to this idea, those who were best informed on the subject agreeing that there was no objection to the latter temperature from the standpoint of injury to the machine. Nevertheless, we find in the latest edition of the Standardization Rules of the Institute, which have been prepared since that time, the same temperature limit specified for mica and other insulating substances which are grouped with it in Class B, as was adhered to before; namely, 125 degrees ultimate temperature, or 80 degrees maximum observable temperature rise.

At the joint electrical meeting held in Chicago this week, Mr. Newbury presented another paper dealing with this subject. Since the meeting a year ago additional evidence has accumulated in support of the position taken at that time, and both Mr. Newbury and Mr. Lamme, the author of the other paper presented at the same meeting, produced convincing evidence of the safety and desirability of permitting temperatures of 150 degrees in this type of machine in specifications and contracts. Mr. Newbury's paper especially emphasized the uselessness of specifying a low temperature rise in the stator of large alternating-current generators while permitting a higher rise of temperature in the rotor. It is sometimes thought that the larger margin in the armature will provide a generous allowance for overloads, but it was shown in this paper that this is a delusion and that, unless a similar margin is provided in the rotor, the range of possible overload in actual operation will be very small. This is partly due to the temperature limits in the rotor itself and partly to the fact that the high temperature makes it necessary to have an excessive exciting voltage in order to provide the necessary current in the field. It was shown in the discussion not only that 150 degrees is a safe operating temperature for mica insulation but that this substance can withstand very much higher temperatures for days, or even months, without damage, and that this condition offers a margin for possible overloads which is quite sufficient.

Mr. Newbury in his paper made an earnest plea for rational temperature guarantees in generators of the type under discussion. He regards as rational a guarantee which puts the same limits on both rotor and stator, giving each the same factor of safety so that the generator, like the traditional one-horse shay, should not reach the breaking limit in one part sooner than in another. He also considers it rational to specify operating conditions which the machine must meet for the highest load which will ever be imposed upon it and then operating normally at a lower load. This seems preferable to rating the machine at a load which it will ordinarily carry but really requiring in its construction a margin for overloads which is to a certain extent indefinite.

CABINETS FOR MIXED SYSTEMS.

In interpreting and enforcing the provisions of the National Electrical Code, it is necessary to keep in mind, so far as possible, the reasons which actuated the framers of the Code rules and the objects to be attained by their application, if a reasonable construction is to be placed upon the actual wording of a Code rule. Just as a literal rendering of the law and blind adherence to precedent does not always lead to the dispensation of justice in courts of law, so an adherence to the literal wording of the Code may not always result in achieving the object for which the rules were framed. When questions arise which are not specifically covered by the Code rules, or where the application of a particular rule is not clear, reliance must be placed upon the apparent intent of the rules and the general object to be achieved by them. Most of the inspection departments in the country are supervised by men who realize the necessity for a reasonable interpretation of the Code, and who consider unusual conditions arising in their respective jurisdictions on their merits, rather than by an inflexible and hidebound adhesion to the literal wording of the rules.

If this principle of interpretation were applied to the questions considered by the National Association of Electrical Inspectors it would seem to present a basis by which a more uniform interpretation of the Code might be secured. Question 336, which is considered this week, presents a case which is not explicitly covered by the Code. Rule 19*b* states that cabinets and cutout boxes must be of metal when used with metal-conduit, armored-cable or metal-molding systems. From this it is to be inferred that wooden cabinets are acceptable for use with knob-and-tube work or exposed wiring. The question concerns the type of cabinet to be used with a mixed system, and the answer hinges upon the purpose in view in requiring metal cabinets upon metal-protected systems.

One object in requiring the metal cabinet on such systems is probably to maintain the electrical connection between all parts of the metal protection. Conduits are required to be grounded, and by maintaining electrical connection through boxes and cabinets the grounding of any part of the system insures that every part is grounded. Grounding of separate parts of the system would of course achieve the same result, but the integrity of the metallic connection throughout is a better guaranty of this result. Considered from this standpoint, if a single circuit issuing from a cabinet has metal protection, there is no need for a metal cabinet,

but if more than one circuit has metal protection, the cabinet also should be of metal. In Question 336, only one circuit comes to the cabinet in conduit, and this is not stated to be the service connection but may be a sub-main. This seems then to be a case where a wooden cabinet should be permitted.

Of course there are other reasons why metal cabinets are desirable, and some persons favor the elimination of wooden cabinets entirely. But if wooden cabinets are acceptable for knob-and-tube work, what objection is there to their use where such a system joins on to conduit construction, providing of course, that the end of the conduit is properly fitted, as indicated in the last answer to this question? Yet the official answer to this question are about equally divided.

In the answers to Question 337 this week, the sixth and tenth answers refer to load-factor as an element in determining the size of main necessary to supply the four motors. We think this must have come about through a misconception of the significance of the term used. The load-factor is determined by the number of hours the motors are in operation and their average condition of load. If it never occurs that all of the motors are fully loaded at one time, then it is feasible to reduce the size of the mains. But the load-factor in this case may be no smaller than if all the motors are operated simultaneously for only a few hours per day. What is of importance here is the diversity-factor, which expresses the relation between the maximum power actually used, and what would be used if all motors were fully loaded simultaneously. For a case where there are not more than four motors, the diversity of use will probably not be great, and it would be safe to give it consideration only when it is known that all four motors *cannot* be loaded simultaneously. If it is possible that on even one day in the year all the motors would be fully loaded simultaneously it would not be safe to make any allowance for diversity.

WATER-POWER DEVELOPMENT.

With another session of Congress approaching, the enactment of suitable legislation for permitting the development of water power upon navigable streams and upon the public domain demands attention once more. For many years those interested in the development of such water powers have harbored the annual hope that adequate legislation might be passed by the national Congress. But each year they have been disappointed. Bills have been presented in Congress and have gotten as far as passage by one house only to meet with defeat in the other. The deadlock arises from the wide differences of opinion as to the conditions which should be imposed upon those who undertake the development of this great natural resource.

The subject was brought up at the recent convention of the Southeastern Section of the National Electric Light Association and resolutions were adopted voicing the great importance to the Southern States of federal legislation which will permit hydroelectric development. The resolutions point out that development can be best undertaken by a public utility company whose service of the public is based upon reasonable rates, good service and skilled management, fair and honest relations with the public, ability to meet or anticipate all power demands made by its community, and a financial responsibility that creates stability and permanence of service. The resolutions very truly declared that the present attitude of the Federal Government is unwise and indefensible in view of the needless waste of available power, and that it is essentially unfair towards the communities which need this power and are unable to secure it. While every necessary safeguard should be thrown around public rights, the present condition of non-use cannot be justified.

This question has been agitated so much that it is doubtful whether the mere adoption of resolutions will accomplish much toward the desired end, but it may awaken the sensibilities of newly elected congressmen to the needs of their constituents and interest them in the early passage of the much needed legislation. The only likelihood of such legislation being enacted lies in the recognition by both sides to the controversy that some ground must be given if any practical results are to be obtained, and that conditions of development should be made just as liberal as possible while retaining to the whole people the values residing in the natural resource, so that future generations may be free to control its use as they see fit. This involves an indefinite permit rather than a perpetual or limited-term permit, and provision for purchase by the Government at a price based upon cost rather than future value. The control of accounting, rates, etc., should, of course, rest with some government commission, such as now controls utility corporations in many states.

The situation at Niagara Falls, to which we referred last spring, has become even more acute with the embargo which has been placed by the Canadian Government upon the export of hydroelectric power to the United States. Buffalo is suffering from a shortage of light and power which will not be permanently relieved until the new steam generating station of the Buffalo General Electric Company, at Tonawanda, N. Y., is placed in operation. The War Department has sanctioned the temporary use of additional water from the Niagara River to improve conditions during the emergency, but the permit for this will expire on January 1, 1917, and dependence must be placed upon steam power after that date.

Opposition to further development of power at Niagara Falls is based upon fears for the destruction of the scenic beauty. If the matter were left in the hands of engineers, the scenic beauty could be conserved while at the same time the utilized power could be increased by the construction of a submerged diversion dam above the Horseshoe Falls. As things are going now the peak of the horseshoe is wearing away so fast that there will soon be little water going over the American Falls and the scenic beauty will be marred as fully as by the diversion of water for power purposes.

Happenings in the Industry

Electric Power Club Adopts Standard Sizes for Carbon Brushes—Heating and Temperature Rise Discussed at Chicago Section Meeting—New Attendance Record at Cincinnati Electric Show—Government Statistics Show Heavy Electric Exports for September—War Department Authorizes More Water to Relieve Buffalo Power Shortage—Miscellaneous Notes

MANUFACTURERS ADOPT STANDARD SIZES FOR CARBON BRUSHES.

Decision Made at Semi-Annual Meeting of Electric Power Club at Hot Springs.

The seventh semi-annual meeting of the Electric Power Club was held at Hot Springs, Va., on November 15 to 18. About 70 were present, representing 30 manufacturers of motors, generators, transformers and industrial-control apparatus.

The president's address outlined briefly some of the things accomplished by the Club during the past six months. He said in part: "True cost accounting is the financial heart of the business corporations of this country. It is a guarantee to the stockholders. It is a guarantee of credit risks. It is a guarantee against receiverships. It is a stabilizer of uniform prices. The primary cause of price cutting is the lack of knowledge of one's true costs." The value of associations was emphasized in the words, "an industry as a whole cannot work to its fullest benefit without co-operation and interchange of ideas of the people of the industry; hence we find the necessity of associations as means through which experiences may be discussed, investigations made, and unity of action taken. An association for each industry is essential to the economic, moral and financial success of such industry."

The various technical committees brought in reports of their work and many of the recommendations they made were adopted.

One of the most important things adopted was standard sizes and limits for carbon brushes. A large number of rules covering performance, specifications for motors with 50, 55, 70 and 75 degrees temperature-rise rating were approved and will be published in the next edition of the standardization rules which will be printed in two or three months.

Directors' Meeting of Society for Electrical Development.

The regular meeting of the board of directors of the Society for Electrical Development was held in the office of the Soceity in New York City, on November 15.

James M. Wakeman, general manager of the Society, read his report outlining the work carried on by the Society since the previous meeting of the board. The report dwelt particularly upon the electric-range campaign, the poster competition, and special service rendered to members.

Inasmuch as it is customary to have the Jupiter of the Jovian Order serve upon the board of directors, and that the new Jupiter, Henry L. Doherty, is already upon the board, representing the central-station interests, a motion was made and carried that Ell C. Bennett, Mercury of the Jovian Order, be invited to sit upon the board during Mr. Doherty's term as Jupiter.

It was decided that another house-wiring campaign should be conducted during the coming spring to be known as "House-Wiring Season" to run from April 1 to May 15.

A letter from Prof. George D. Shepardson of Minneapolis was read, on the subject of having engineering students sell electrical devices during their vacation season. A committee was appointed to work out the plans.

HEATING AND TEMPERATURE GUARANTEES OF ELECTRICAL MACHINERY.

Two Papers Presented and Discussed Before Joint Meeting of Electrical Engineers in Chicago.

On the evening of November 27 a joint meeting was held in Chicago by the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers. Two papers were presented by B. G. Lamme and F. D. Newbury, of the Westinghouse Electric & Manufacturing Company. Mr. Lamme's paper was entitled "Temperature Distributions in Electrical Machinery," and called attention to the fundamental principles of heat distribution, which were shown to be quite similar to those governing electrical distribution in a circuit. The paper discussed at some length the problems of heat generation, heat flow and heat dissipation, upon which the resultant temperatures of electrical machinery depend. The various paths of heat flow in electrical apparatus and the effects of heat resistance in such paths were pointed out. The effects of rapid heat flow on the equalization of the temperatures and on their measurements were also considered. Several fallacies in temperature guarantees and temperature indications were pointed out, also some of the more common errors in the methods of measurements were shown. The paper concluded with the statement that no hard and fast rules can be made to cover the actual facts of heat distributions in electrical machinery except in a very general way, and that commercial temperature measurements should be considered as only approximate.

The paper by Mr. Newbury made a strong plea for the standardization of temperature guarantees when these are based on internal temperatures measured by thermocouples. The paper recommended that in all cases the maximum safe operating temperature of the insulation be used in the temperature guarantee instead of using a lower temperature. The former standardized guarantee, namely, rise of 50 degrees centigrade as measured by thermometer, was contrasted with the present wide range of temperature rises from 60 to 100 degrees that have been called for in specifications when thermocouples are used for measurement. Arguments were presented, both from the standpoints of the designing and operating engineers, for the use of a standardized temperature rise of 100 degrees centigrade. The temperature conditions existing in both stator and rotor of a typical large high-voltage turbogenerator were illustrated by means of curves, and examples based on these curves were given to show that a low temperature-rise guarantee for the stator does not necessarily result in margin for overloads. This margin is the main argument advanced in favor of low temperature rise. The author contended that the only way in which the purchaser can be certain of overload margin is to have the specifications call for the maximum rating desired, in which case the maximum safe operating temperature may logically be made the temperature guaranteed. He showed that in the case of these large turbine units, each representing an investment of several hundred thousand dollars, the designer and manufacturer must be conservative because much is at stake. Consequently, if they are ready to guarantee safe operation with a temperature rise of 100 degrees, it can be taken for granted that this is conservatively safe.

Written discussions were read that had been presented by A. M. Gray, W. J. Foster and C. J. Fechheimer. Professor Gray showed that while designers are ready to guarantee higher operating temperatures as being quite safe, the purchasers are still somewhat reluctant to accept them, although he was convinced that the manufacturers were really conservative in these higher guarantees. Mr. Foster did not agree with the recommendation of Mr. Newbury for the same temperature guarantee in rotor and stator. He thought that a lower temperature in the latter had certain advantages. Mr. Fechheimer's discussion dwelt on the serious errors of ordinary temperature measurements and therefore the futility of customers relying on temperature guarantees that can be checked only very roughtly at best. V. M. Montsinger discussed the heating conditions in transformers, showing that while somewhat simpler than those in rotating electrical apparatus, the same general principles apply. He also advocated the use of maximum instead of average temperature.

Peter Junkersfeld recited early experiences with large turbogenerators in the Fisk Street plant of the Commonwealth Edison Company, Chicago, showing that one unit, which had been on test with a load of 8,000 kilowatts for many hours, and which was supposed to carry an overload amounting to a total of 12,000 kilowatts for two hours, burnt out before this higher load was on for more than one hour. Thermometer indications showed a relatively low temperature of the accessible parts, but it was evident from this experience that the interior of the machine was at a very much higher temperature. When this machine was rewound, exploring coils were imbedded in various parts which showed conclusively on subsequent test that the interior parts of the machine were at a very much higher temperature than those accessible to the ordinary thermometer test. He felt that the experience gained through the burning out of some of these large generators was necessary in order to emphasize the importance of taking care of the high temperatures in the vital parts of the apparatus.

Paul M. Lincoln showed why the laws of heat distribution are not so well known as those of electrical circuits. Heat dissipation by means of air currents varies almost directly with the rate of flow of these currents up to a definite limit, at which heating is itself promoted by the windage due to excessive air velocity. He discussed at some length the comparison of the temperature co-efficients of electrical resistance and heat resistance. W. C. Bauer said that while electric strength was increased in value by increasing the thickness of the insulation, heat dissipation and consequently the safety of the machine was dependent upon the thinness of insulation.

N. J. Conrad cited some figures obtained on tests with exploring coils on large turboalternators. In the case of one machine on which observations from these coils showed a steadily rising temperature at moderate load, it was deemed desirable to investigate to find the cause. It was found that a small amount of oil was being thrown by one of the bearings, and this with the fine dust carried by the ventilating air was choking up the ventilating passages in the machine. This clogging of the ducts prevented the heat from being carried off and resulted in steady rise of temperature. This showed the importance of making continual tests during operation. Others who discussed the subject were C. A. Keller and M. M. Fowler.

Mr. Lamme then took up the discussion by pointing out the marked difference in the safety characteristics between Class A and Class B insulations. The latter not only can withstand a higher temperature, say a set limit of 150 degrees centigrade, but possess a much higher factor of safety in ability to withstand higher temperatures for short periods than the fibrous insulations, which have a very sharply defined maximum limit of about 105 degrees centigrade. Mica can in the pure state withstand 750 or even 1,000 degrees centigrade for a short time. If it contains a large percentage of binder, however, or is not well mechanically packed or held in place, it breaks down at a lower temperature. He spoke of the good results obtained with using mica for insulation of large generators which was done first in the Niagara Falls generators that were built in 1894 and whose insulation is apparently in as perfect condition now as at that time. In the case of a generator that was rewound with a fibrous insulation early burnout resulted and after a second rewinding with mica as insulation no further trouble has developed. Conclusive evidence obtained by manufacturers has shown the reliability of mica for insulating important machinery. The value of cleaning the air used for cooling generators was pointed out by Mr. Lamme, who said that an amount of air equal to the weight of some of these large units was passed through them per hour. Tests conducted at East Pittsburgh showed the value of washing the air used for this purpose. In conclusion, he said that there was no good way of testing the temperature of rotors while running; in the case of revolving fields resistance measurements from time to time may give some indication of the temperature, however.

The discussion was closed by Mr. Newbury, who stated that the question of temperature guarantees is a broader one than appears to be the case when machines of different temperature guarantee can be obtained at the same cost. In the long run the most economical machine must win out. He cited the remarks of a number of designing engineers to show that 150 degrees centigrade is a perfectly safe operating temperature for mica insulation. Any increase in the dielectric factor of safety may reduce the factor of safety as regards temperature, which shows that the designer must use his best judgment in balancing the various requirements in any important design.

NEW ATTENDANCE RECORD AT CINCINNATI SHOW.

Ohio Valley Electrical Exposition Closes with Attendance Record and Renewed Interest by Public in Things Electrical.

The Ohio Valley Electrical Exposition in Cincinnati closed on Saturday night, November 25, after a highly successful week, in which the interest of the public, as evidenced by the attendance, ran far ahead of the electric show of last year. The fact that double the amount of space was devoted to exhibits indicates the extent to which the industry supported the show, both the north and south wings of Music Hall being used instead of only the south wing, as last year. Every public-service company in the city using electricity in any way used a large amount of space, taking the opportunity to demonstrate the manner in which service is furnished. The Union Gas & Electric Company had a completely furnished modern apartment, with all kinds of electric devices for domestic use; the Cincinnati Traction Company had a unique exhibit in the form of a full-sized electric car, the framework of which was skeletonized so as to show the working parts in full view; and the Cincinnati & Suburban Bell Telephone Company had a working exchange so arranged as to form a demonstration of the operation of the telephone. The Union Light, Heat & Power Company, serving the Kentucky cities across the river from Cincinnati, showed a full line of electrical appliances in use, while all of the manufacturers represented in Cincinnati, and numerous concerns handling machinery and similar goods, used ample space to exhibit their products.

A demonstration of electrical cooking attracted an unusual amount of interest, particularly on "Pie Day," when scores of pies were baked and samples passed among the interested spectators. A farm layout, showing the operation of a small generating unit for farm light and power purposes, also at-

tracted attention, especially in connection with the daily exhibit of an electrically operated milking-machine, for which a local dairy furnished four registered Jerseys.

A motion-picture exhibit, showing the extent to which the "movies" depend upon electricity both for the photographic work and the exhibition of the pictures, did a thriving business taking pictures of visitors at $5.00 for a few feet. The ice-skaters on the rink on the Music Hall stage were also taken in motion. The skaters formed the principal outside attraction, with the Marimba Band.

The management of the exposition reports that on Monday, the first day of the week, and the second of the show, the attendance was four times that of last year, partly by reason of the proceeds being shared with the "Save-the-Zoo" fund. Other special days, such as Rotary Day, drew well, and contributed much to the undoubted success of the Exposition, which is now firmly established as an annual Cincinnati event.

Electrical Exports for September Close to Record.

The electrical exports of the United States for last September were only a few per cent less in total value than the record established in the preceding month. This fact is disclosed in the detailed summary of the foreign commerce of the United States just published by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

The number of articles shipped in the four electrical classes for which actual numbers are reported were as follows in September: Electric fans, 1,657; arc lamps, 45; carbon-filament lamps, 81,875; metal-filament lamps, 455,668. In this last class this is a falling off of nearly 45 per cent from September of a year ago.

In the following table are given the detailed electrical-export figures for last September and for September of 1915:

Articles.	Sept., 1916.	Sept., 1915.
Batteries	$ 157,051	$ 123,377
Dynamos and generators	108,453	109,990
Fans	23,593	33,193
Insulated wires and cables	513,946	318,478
Interior wiring supplies, etc. (including fixtures)	71,840	57,871
Lamps—		
Arc	982	397
Carbon-filament	7,577	7,041
Metal-filament	86,503	118,464
Meters and other measuring instruments	85,395	51,044
Motors	327,727	417,375
Telegraph instruments (including wireless apparatus)	10,671	5,681
Telephones	69,933	37,180
Transformers	103,251	76,433
All others	1,924,295	906,767
Total	$3,491,217	$2,262,291

War Department Authorizes Additional Diversion of Water to Relieve Scarcity of Power in Buffalo.

Following a telegram sent by Devoe P. Hodson, public service commissioner for the second district of New York, anent the shortage of Niagara Falls power in Buffalo, to Newton D. Baker, Secretary of War, the latter authorized the Niagara Falls Power Company to divert an additional 1,400 cubic feet of water per second from the river during the peak-load periods in the morning and evening.

Canada's embargo against exportation of Niagara Falls power to this country is causing the loss of between $100,000 and $250,000 a day to Buffalo manufacturers, according to statements made by representatives of the city's larger industrial concerns at a conference held with Commissioner Hodson and officials of the Buffalo General Electric Company. The outcome of the extended discussion of the situation was the telegraphic appeal to Secretary of War Baker, who wired back permission for the power company to temporarily extend its license to use extra water from the river. The extension will be in effect until January 1, before which time the first unit of the Buffalo General Electric Company's new plant will be in operation, thus affording relief.

It was brought out at the conference that many large factories using Niagara power have had their supply cut off at 4:30 p. m., and that lately the shutting-down had been shifted to an hour earlier.

Representatives of the Black Rock Manufacturers' Association testified before the commission that several of their members' plants have been paralyzed.

J. F. Small, representing the Dold Packing Company, said: "There has been a total loss of several thousands of dollars to my firm already. We are unable to fill our contracts, and our labor force is becoming dissatisfied by the continual lay-off of work. Some days we shut down several hours before closing time because of a failure of power."

George H. Bradley, representing the grain-elevator interests of Buffalo and Niagara district, also testified that the corporations he represented have been greatly injured by the shortage of power.

President Huntley, of the Buffalo General Electric Company, said co-operation of the manufacturers will be asked in conserving the power supply by using only such quantities as will serve to permit operation of plants, and suggestions tending to aid in lessening the present difficulties will be thankfully considered.

"The Canadian companies control the power supply," said Mr. Huntley, "and we have no means of compelling our local patrons to lessen their consumption, which most of them do not do, and there is only one way to get along with the shortened supply of 13,000 horsepower every day, to cut it off entirely, rotating in this method from section to section of Buffalo, as fairly and considerately as possible."

The Canadian embargo situation is regarded as hopeless, owing to Canada's need of power for the manufacture of munitions and in other factories. The problem must be solved on this side of the frontier. However, it is only a temporary one, since the new Tonawanda plant of the Buffalo General Electric Company will be able to supply 50,000 horsepower by January 1. The company has undertaken an extension in the capacity of this plant which will bring it to 200,000 horsepower, instead of 80,000 as originally planned.

Safety Code Issued by Bureau of Standards.

The Bureau of Standards has issued as Circular No. 54, a second edition of the National Electrical Safety Code, which is now in form for examination, trial and constructive criticism. The first edition, issued in 1915, was intended for discussion and criticism only.

The Code comprises four parts. Part I consists of rules for the installation of machinery, switchboards and wiring in central stations and substations. Part II consists of rules for the construction of overhead and underground lines for the transmission and distribution of electrical energy and intelligence. Part III consists of rules for the installation of electrical apparatus and wires in buildings. Part IV consists of rules for safeguarding employees.

After a trial period, modifications of some of the rules will, of course, be found desirable. A revised edition will therefore be prepared as soon as necessary. Subsequent revisions should, however, be made only at somewhat infrequent intervals in order to assure a reasonable degree of stability for electrical practice throughout the country. The advantages in this respect of a national, over varying local codes, are readily appreciated. The Bureau desires to secure the experience of all the interests concerned with the Code and hopes through the assistance of users and administrators of the Code to make it as useful as possible in promoting the safety and economy of electrical service. The number of copies of this edition is limited, but it is probable that an edition in handbook size will be published.

Advocates Liberal Education for the Electrical Engineer.

On November 21, Prof. W. I. Slichter, of Columbia University, spoke before the Lynn (Mass.) Section, A. I. E. E., on "Education for a Career in Electrical Engineering," and in the course of an able address showed how colleges have been regarded as information shops, and personal education been neglected. Engineers have too often held aloof from public affairs, and have so often withdrawn into their narrow professional spheres of action that their influence has not been duly felt in general affairs of local and national importance. A plea was made by the lecturer for a more liberal education along the usual college lines before the technical engineering courses are studied. On December 6, there will be a lecture on the timely topic "The Mechanical Equipment of the European War."

New Power Plant for Toledo.

The Toledo (O.) Railways & Light Company is to have a new $6,000,000 power plant, which will probably be located on the site of the old Republic Iron & Steel Company's plant on the East Side. The site contemplated contains 27 acres of ground with a large river frontage, which will not only be an ideal location for a power plant, but will also simplify the matter of coal storage, as the company plans a submerged pit with a capacity for 500 carloads of coal.

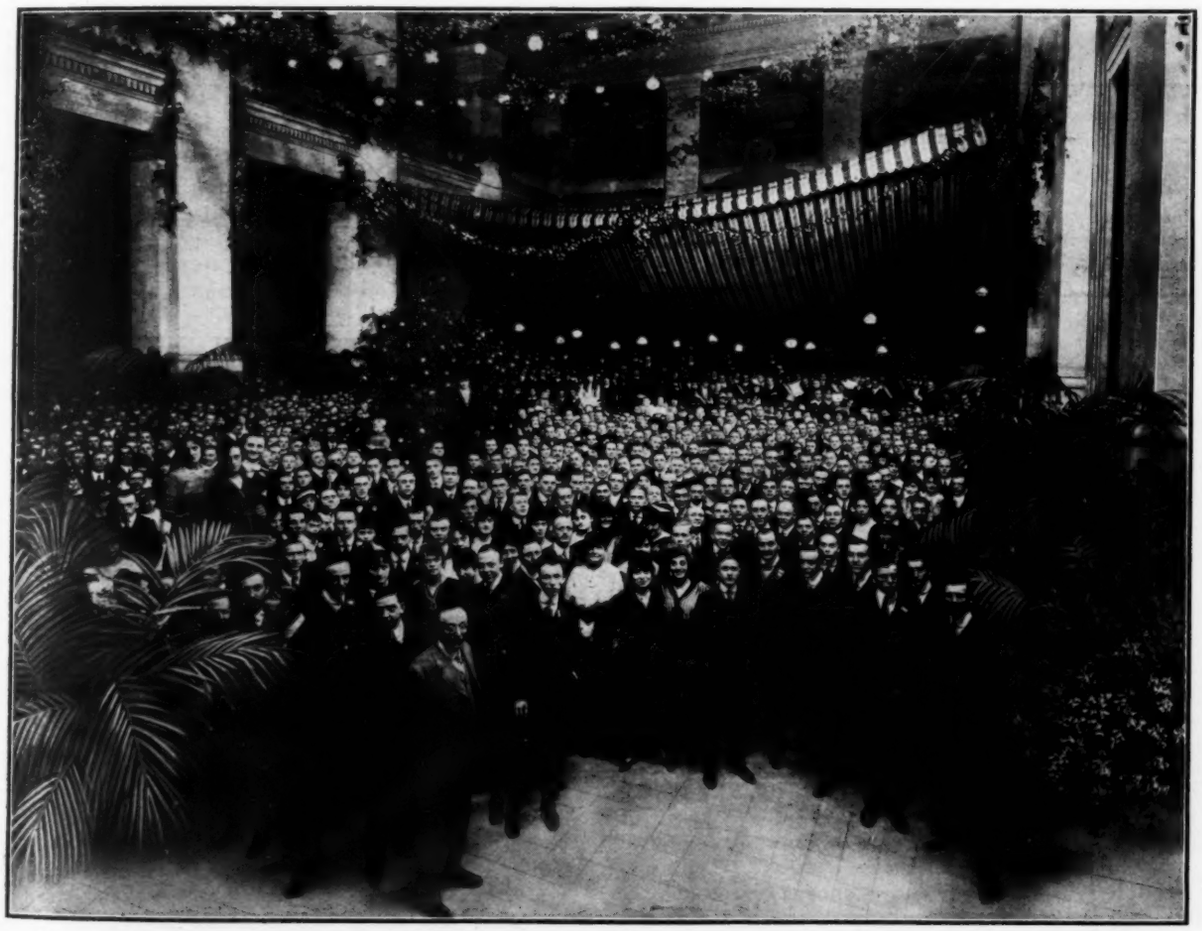
The new plant will have an initial capacity for 120,000 kilowatts, with an ultimate capacity of 200,000 kilowatts. Contracts for two turbines, each having a capacity of 27,000 horsepower, have been awarded to the General Electric Company.

The Water Street power plant will not be abandoned, but will be used to supplement the new plant after its completion.

Electrical Papers to be Presented Before American Society of Mechanical Engineers.

At the annual meeting of the American Society of Mechanical Engineers, which is to be held in New York, N. Y., December 5 to 8, there will be presented a number of papers of particular interest to the electrical industry, among which are the following: Standardization of Power-Plant Operating Costs, by Walter N. Polakov; Tests of a 30,000-Kilowatt Turbine, by H. G. Stott and W. S. Finlay, Jr.; How Does Industrial Valuation Differ from Public-Utility Valuation, by John H. Gray; Mechanical Design of Electric Locomotives, by A. F. Batchelder.

Company Section Gives Unique Garden Party



Over 1,200 people connected with the electrical industry participated in a garden party given by the Commonwealth Edison Company Section, National Electric Light Association, in Customers' Hall, in that company's main building in Chicago, Thursday evening, November 23. The great hall was decked up for the occasion with electric Japanese lanterns, festoons of vines and evergreens, and the like. The feature of the evening was a historical pageant given by 25 couples garbed in costumes of various periods and races. The affair was attended by members of the Committee on Company Sections, N. E. L. A., then in session in Chicago, who were greatly impressed with the magnitude and excellence of the entertainment. Many officials of the Commonwealth Edison Company also attended.

Miscellaneous NEWS NOTES

Spokane Merchants Celebrate Installation of Lighting System.—Merchants and property owners of Main Avenue in Spokane, Wash., recently celebrated the completion of a new ornamental lighting system with a parade and public demonstration.

Consolidate Engineering Colleges.—The colleges of electrical engineering and civil engineering of the University of Kentucky at Lexington, have been consolidated with Prof. E. Paul Anderson as dean. It is proposed also to combine the college of mines and metallurgy with the consolidated engineering school.

Gavel Made From 26-Year Pole.—Paul M. Lincoln, of Pittsburgh, Pa., past president of the American Institute of Electrical Engineers at the close of a meeting held in Spokane, Wash., recently, at which he was the principal speaker, was presented with a handsome gavel which was cut from the top of a Western cedar pole which had been in continuous service for 26 years.

Electric Sign to Warn of Danger to River Boats.—Three signs, the central one to be illuminated by electricity at night, are to be erected on the upstream side of the Big Four bridge over the Ohio River at Louisville. This bridge is about a mile above the head of the rapids at Louisville and the signs will warn water traffic bound downstream of the danger immediately below.

Distribution Problems Discussed by Ohio Association Committee.—The Transmission and Distribution Committee of the Ohio Electric Light Association held a meeting in Dayton November 22 at which a paper on "Transformer Stations" was read by R. H. Krammes, of the Ohio Light & Power Company, Newark, and one on "Distribution" was read by W. E. Beaty, of the Union Gas & Electric Company, Cincinnati.

Relations Between Contractors and Central Stations Considered at Brooklyn Section Meeting.—A meeting of the Brooklyn Edison Company Section of the National Electric Light Association was held November 21, at which a paper by G. J. Leibman, of the sales department, dealing with the relations between the electrical contractor and the central station was the feature. Andrew McLean, editor of the Brooklyn *Citizen*, made an impromptu talk on economic conditions.

Seattle Municipal Trolley Loses Money.—The municipal street railways of Seattle, Wash., continue to lose money, as shown by the report of A. L. Valentine, superintendent of public utilities, in his report for October, the net loss being about $2,000 monthly. Since the city light department took over the street railway substations the power cost is being checked against the value of the substations, so that in October the street railways received $1,069 worth of power without cash outlay.

Nashville Jovians Inaugurate Safety-First Campaign.—The Jovian League of Nashville, Tenn., has elected Robert C. Leonard, power sales engineer, of the Nashville Railway & Light Company, president for the coming year, with W. G. Cameron, of the same company, as vice-president, and C. P. Cochran, city electrical inspector, secretary-treasurer. The league is making plans for a safety-first campaign in the city and contemplates a parade to bring this idea out forcefully.

Cleveland Section Meeting.—The Cleveland Section of the American Institute of Electrical Engineers held its monthly meeting in the club rooms of the Electrical League on the evening of November 20. Chairman E. W. P. Smith introduced the rather startling innovation of allowing the members to invite their wives and sweethearts to the meeting, inasmuch as the subject under discussion was not entirely technical. H. T. Spaulding, of Nela Park, gave an illustrated talk on "The Lighting of the House." A delegation from the Pittsburgh Section also attended.

Town Bureaus for Electrical Inspection in New Jersey.—The Irvington Town Commission is arranging for the presentation of a bill at the forthcoming session of the New Jersey State Legislature to provide for the establishment of bureaus of electrical inspection in towns as now arranged for cities. A similar measure was considered by the Legislature in 1915, but failed in passing the Senate.

Station Operating Conference in Toledo.—The Ohio Electric Light Association held its station operating conference at the Boody House, in Toledo, November 14. About 50 members of the subcommittee were present and in the afternoon inspected the power plants of the Toledo Railway & Light Company, and the Edward Ford Plate Glass Company. The subcommittee will hold meetings in Youngstown and Cincinnati before the annual convention of the Association.

Pittsburgh Section, A. I. E. E., to Hold Annual Banquet.—The annual banquet of the Pittsburgh Section, American Institute of Electrical Engineers, will be held at the Fort Pitt Hotel, Saturday evening, December 9. A program, which includes short talks by President H. W. Buck and George H. Neilson, and special features for the ladies, has been arranged. The officers purpose to make the banquet the climax of America's Electrical Week activities in Pittsburgh.

New York Companies Section Hold Interesting Meeting.—Over 400 were present at a meeting of the New York Companies Section, N. E. L. A., held November 14, at the auditorium, at Fifteenth Street and Irving Place, New York City. Sheriff Alfred E. Smith gave an excellent address on "Politics on New York's East Side." Entertainment was provided by the Employees' Association of the United Electric Light & Power Company. Chairman Walter Neumuller presided.

Form Alabama Technical Association.—The Alabama Technical Association has been formed by engineers of that state at a meeting held at Birmingham, with more than 50 engineers present. The officers will be selected by a board of directors composed of two representatives of each of the six national organizations represented in the membership. H. M. Gossman and Martin J. Lide, both of Birmingham, represent the American Institute of Electrical Engineers. Mr. Lide was elected temporary chairman of the board.

Utility Seeks Annulment of Compensation Order.—The Southern California Edison Company, of Los Angeles, has filed with the Railroad Commission a petition for an order determining that the findings of the Commission made as to the just compensation to be paid the company in the city of Los Angeles for the company's distributing system in Los Angeles, shall no longer be of any force or effect, as the city has failed to commence an action in eminent domain within the time required by the public utilities act. The price fixed by the Commission on September 6 was $6,328,000.

Committee on Company Sections, N. E. L. A. Meets in Chicago.—An important event to those interested in the activities of the National Electric Light Association was a meeting of the Committee on Company Sections held November 23 in the main building of the Commonwealth Edison Company, Chicago. Chairmen of company sections throughout the country attended the meeting to discuss ways and means to increase the number and effectiveness of company sections of the association, to make plans for co-operative group, welfare and educational work, and to devise means of increasing company section activities. Chairman Frank A. Brick, of the Philadelphia Electric Company, presided.

Union Gas & Electric Company's New Station

Plans for New Power Plant, Now Under Construction, Provide for an Ultimate Installation of 150,000 Kilowatts, One-Half of Which Is Now Being Made

THE new power station now under construction in Cincinnati by the Union Gas & Electric Company is the result of some interesting and unusual conditions of the past, and its design embodies much originality and skill in overcoming natural difficulties incident to the location chosen.

The old power station is centrally located in the city, but it lacks railroad connections, and depends for condensing water upon a supply taken from the neglected Miami & Erie Canal under a state lease now nearing expiration.

This water supply has for several years been inadequate and unclean, the canal within the city limits has been leased to the municipality, and its water is about to be diverted to a distant stream in order that the canal bed may be occupied by a municipal rapid transit road.

The existing electric plant cannot be economically operated without condensing water, and cannot carry its present connected load when so operated, wherefore it became an immediate and unavoidable necessity to construct a new plant located where ample water supply and transportation facilities were permanently available.

The company's West End artificial gas plant, shut down in 1909, when natural gas superseded artificial gas throughout the city, is almost ideally located for all electric power plant purposes, on the north bank of the Ohio River, adjacent to the business and industrial centers, with railroad connection to all trunk lines entering Cincinnati, in addition to landings for river lines, thus enabling a fuel supply to be drawn by two independent transportation methods and many routes from the coal fields of West Virginia, Pennsylvania, Ohio, Kentucky and Indiana.

Several coal roads, and large coal-producing companies have their main storage yards immediately adjacent. Also, the high-pressure natural-gas line supplying the entire city terminates on this property and constitutes a valuable auxiliary fuel supply to the company.

This lot, chosen for the new station, lies between Front Street and the river, being 831 feet frontage by 550 feet in depth.

The station building will top the river bank, extending 333 feet parallel thereto and 222 feet in width.

Its massive sub-structure, of reinforced concrete, extends 75 feet below ground to coarse gravel below low water level, its brick walls rise 100 feet from foundation top, while its two steel stacks reach 100 feet above the wall crest, and the total height from base of intake pit to top of stacks is 309 feet.

The turbine room parallels and overlooks the river, the switch house, of equal area, is directly above, and the boiler room adjoins the turbine room, each being 300 feet long and respectively 68 feet and 150 feet in width.

In addition to these principal rooms, the building will contain office space for the chief engineer and assistants, a system operators' room, a switchboard or control room overlooking the engine room, a first-aid room and equipment, a fuel and gas testing laboratory, a restaurant, sleeping rooms, machine shop and full complement of employees' showerbaths, steel lockers and sanitary facilities.

The structure will be in every way an ornament to the city, and, owing to its size and conspicuous location, will be visible for several miles in all directions and to all passengers entering the railroad stations of the city.

One of the most interesting features of this new power house will be the design of the sub-structure adopted in order to avoid excessive lift on condensing water and to afford stable support on unstable ground, for the great weights of building and equipment.

The Ohio River fluctuates in level at Cincinnati more than 70 feet, due to spring floods in its tributaries, and this flood level puts eight feet of water over the entire site of this power station, such condition having occurred on two known occasions, at 30 years' interval, and lesser floods are annual.

The soil on which the building will stand is a porous cinder fill about 55 feet deep at the river bank, and resting upon strata of sand and gravel deposited on shale rock below the river bed.

These conditions require all operating equipment to be safe above, or protected from flood water, the sub-structure and bank must be guarded from erosion by swift currents, firm ground must carry the weights, and condensing water must be pumped at least expense.

These problems have been solved by building intake and discharge tunnels from the open river into the bank below the turbine room, the intake tunnel, 10 feet by 25 feet by 163 feet, terminating in the bottom of a reinforced concrete intake well 60 feet in diameter, 86 feet deep, with walls six feet thick rising to the engine room floor. Condensing water from this tunnel and well traverses grills and revolving screens, whence it is led through 54-inch suction pipes to the pumps and condensers located on either side, at the bottom of two condenser wells similar to the intake well, but each 68 feet in diameter, 84 feet deep and having eight-foot walls rising to the engine-room floor.

FACTS ABOUT NEW POWER PLANT

The new power station of the Union Gas & Electric Company will have an ultimate capacity of 150,000 kilowatts.

The installation now being made comprises two 31,250-kilovolt-ampere turbogenerators, each supplied by four boilers, each having a heating surface of 12,625 square feet.

Every modern idea in central-station construction has been embodied in this plant, making it a model of its kind.

Mechanical and Electrical Features.

The mechanical and electrical equipment of the station have been selected having in view, as chief considerations, simplicity, reliability and efficiency, and special effort has been made to secure apparatus best adapted to its particular place and function.

Complete electric operation of all station auxiliaries is adopted for reasons of simplicity, reduced heat losses, lower maintenance, and increased over-all station efficiency.

River coal will be mechanically unloaded, hoisted and delivered either into the yard storage or the inside coal pit beneath the boiler room floor.

Rail coal will be dumped without rehandling either into the yard storage or the inside coal pit.

Ashes drop from the boiler grates through hoppers into standard railroad cars hauled direct to dumping grounds.

Yard switching of fuel, freight and ash cars will be done by the company's electric locomotive and crew.

An electric coal gantry crane of 200-foot span traverses the yard storage space parallel to the boiler room, and delivers to transfer cars or conveyor hoppers, which fill the inside coal pit.

The boiler room equipment forming the initial section includes eight Babcock & Wilcox boilers, each having 12,625 square feet of heating surface and capable of evaporating hourly 100,000 pounds of water into steam at 250 pounds gauge pressure and 250 degrees Fahrenheit superheat.

Each boiler is steel cased, equipped with an electrically driven inclined grate stoker and forced draft, and each boiler is supplemented by a superposed high-pressure economizer of 8,256 square feet heating surface and bypass flue and motor-driven induced draft fan.

Boilers are set in independent single units, four being allotted to each main turbine unit, allowing one spare boiler per turbine.

A traveling crane traverses the central aisle of the boiler room, feeding weighed coal to each stoker hopper from a fuel pit below boiler room floor.

Generating Equipment.

The initial generating units comprise two Curtis horizontal steam turbogenerators, each rated at 31,250 kilovolt-amperes, 13,200 volts, three-phase, 60 cycles, taking steam at 230 pounds gauge pressure and 200 degrees Fahrenheit superheat.

The main turbine units are arranged in pairs over each condenser well, and each exhausts into its own condenser directly beneath. The condensers each have 52,000 square feet of cooling surface in vertical tubes and capacity to condense 330,000 pounds of steam per hour. All condenser pumps are electrically driven, of the centrifugal type.

The excitation system includes three independent sources, there being a direct-connected 210-kilowatt 250-volt generator on each main turbine unit, and a 200-kilowatt emergency steam turbine direct-connected to a 200-kilowatt 250-volt exciter generator, and a 200-kilowatt 600-volt direct-current emergency generator, available when requisite for starting up stoker equipment and 600-volt auxiliaries, but normally idle.

An emergency storage battery for excitation is also provided, having automatic connections to each alternator field, operative in event of failure of the direct-connected exciter on the main unit. The station bus voltage is controlled by a master regulator.

Both the station and the unit auxiliaries, equipped with alternating-current induction-motor drive, are supplied with 600-volt three-phase current taken from auxiliary transformers, of which there are three, each of 1,800 kilovolt-amperes capacity, each generating unit having one transformer for its auxiliary equipment, and one such transformer being reserved for general station and emergency service.

Auxiliary apparatus having direct-current motor drive is supplied at 600-volts pressure through two 750-kilowatt, 600-volt three-phase rotary converters, with transformers connected to the main station bus, and located on the turbine-room floor.

Control of all station and unit auxiliary circuits is located on the operating floor adjacent to the main generating units.

A 110-ton four-motor traveling crane traverses the turbine room for installation and handling of machinery, and for manipulation of intake screens when necessary.

Switchboard.

The main switchboard will be located in the station operators' room overlooking the turbine room, and includes a benchboard for control of main generators and exciters, two vertical boards for the control of outgoing feeders, and corresponding vertical panels supporting watt-hour meters, regulators, synchronizers and sundry instruments.

No high-tension current is brought to any switchboard or control room for operators' manipulation, all high-tension switches and busbars being located in the switch house above the engine room, where high capacity oil circuit-breakers with remote electrical control, and high-tension busbar system completely inclosed in a brick and stone compartments, yield a maximum degree of safety to operators and workmen, and reliability of service.

Reactance coils in the main busbars and in each outgoing feeder, limit the emergency current from generators and feeders in event of short-circuits, and an emergency bus assures the maintenance of service during repairs or maintenance work on the main bus and oil switches.

Energy to Supply Entire System.

The energy generated in this new station will be transmitted to all present power stations and substations of the company as well as to the allied Kentucky properties by underground high-tension cables, running from the new power station through large tunnels to points above high-water mark, beyond which the transmission cables will continue underground in conduits of the usual construction.

The initial station equipment above described represented but one-half of the available capacity of the building now under construction, whereas the plans have been prepared for future extension to duplicate the construction now in progress, thus providing for a total ultimate development of this generating station to not less than 150,000 kilowatts, or the largest single power station proposed up to this time.

Mode of Providing for Amortization of Plant Described.

At a hearing before the Massachusetts Gas and Electric Light Commission on a stock issue of $231,200 new stock by the Haverhill Electric Company, A. B. Tenney, president, explained the company's method of setting aside a reserve for depreciation of plant.

"We figure 15 per cent of gross income is sufficient to provide to maintain the plant in first-class condition and to provide a fund to take care of such form of depreciation as inadequacy and old age which accrue over a period of years; and from this 15 per cent we deduct the amount spent each year for maintaining the plant, and carry the difference to a reserve against which we will charge, for instance, when one of our turbines which has been in now 12 years, is removed from service, charging against the reserve the full costs of that turbine."

The company's policy is to carry all the plant accounts at cost until the property is finally retired or ceases to exist.

The Haverhill Electric Company is one of several utilities under the engineering management of C. H. Tenney & Company, Boston. It pays $7,300 per annum to the latter, to cover services or salary of a president, treasurer and executives, for which amount the officers arrange the financing and direct the policy of the company. For engineering services, C. H. Tenney & Company are paid a certain per cent on cost of the installation.

Chairman Weed of the Commission and Commissioner Lewenberg deprecated the practice of maintaining companies having as their purpose the making of profit by their dealings with utilities under the commission's supervision. The Chairman remarked that much public criticism arises from this source.

Electricity in the Iron and Steel Industry

General Information on the Processes Involved in the Production of Iron and Steel, with Data on the Electric Power Requirements of Steel Mills

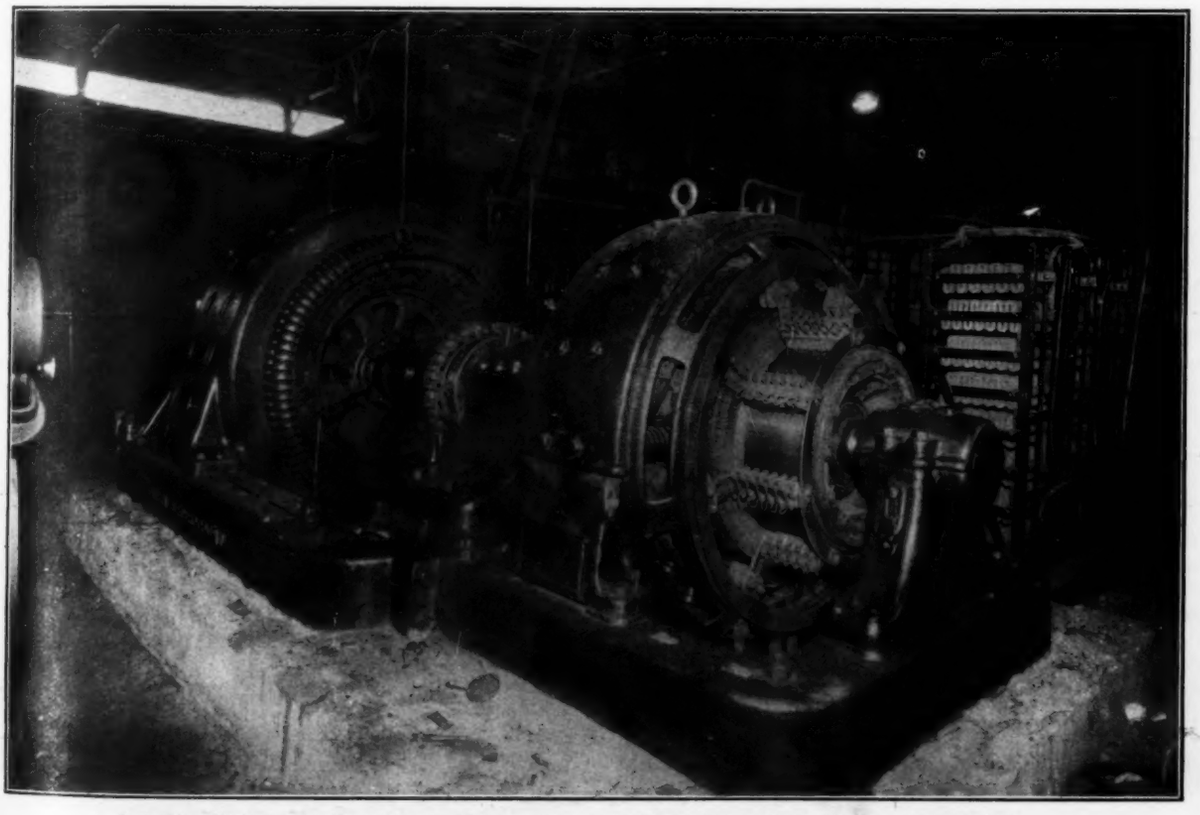
Industrial Power Series—Article No. 183

IRON is one of the commonest of the chemical elements and the supply seems to be limitless and undoubtedly will be so long as the ore supply remains accessible to modern mining methods. Its most important physical properties are its strength, magnetism and hardening qualities, enabling it to retain a durable cutting edge after appropriate manufacture and treatment. Over 95 per cent of all iron ore treated goes into the blast furnace, where it is smelted with coke and preheated air, and a relatively low grade of metal, known as pig iron, is produced. By further treatment pig iron may be converted into metals with widely varying characteristics. It may be remelted to produce white cast iron, and afterward annealed, resulting in the production of malleable cast iron; by remelting, gray cast iron or chilled cast iron may be produced. The pig iron may be subjected to the acid Bessemer process in converters producing Bessemer steel. The pig iron, mixed with steel scrap, may be manufactured into basic open-hearth steel, or acid open-hearth steel. It may be treated in puddling furnaces, producing wrought iron, which may be used as such or may be remelted to produce crucible steel.

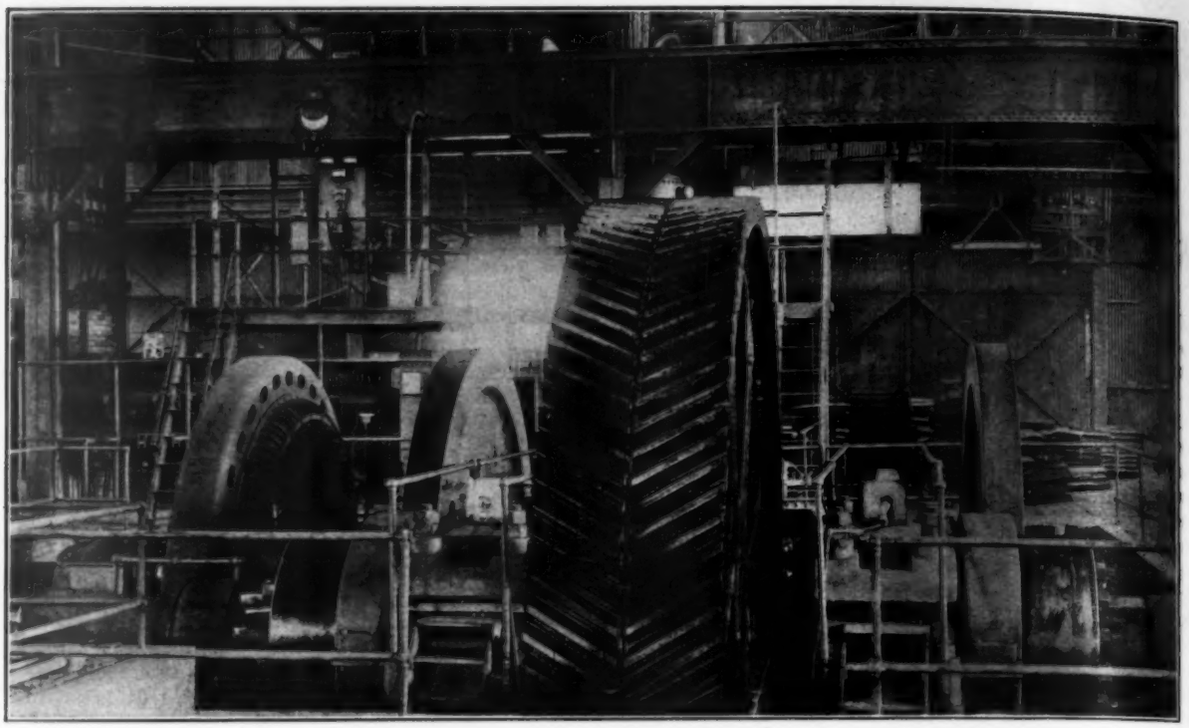
In American blast-furnace practice a column of coke fills the body of the furnace from the bottom of the hearth to the top of the bosh. Alternate layers of coke and ore are placed above the coke, together with a suitable flux such as limestone. Preheated air enters the tuyeres at the top of the hearth. This combines with the fuel and creates a volume of intensely hot reducing gases which heats, melts and reduces the ore. The preheated air has a temperature of from 800 to 1,200 degrees Fahrenheit and is forced under a pressure of about 15 pounds to the square inch. The molten iron, containing from about 3.5 to 4.5 per cent of carbon and other elements in varying quantities, collects in the bottom of the hearth with the cinder, which contains the impurities of the ore, collected on top of it. The metal is tapped out of the bottom of the furnace about every six hours and is cast into pigs or may be transported to nearby steel mills in liquid form.

Pig iron, on account of its impurities cannot be worked or wrought but many millions of tons are used annually in the form of castings. The remainder is purified by oxidizing the impurities. In the manufacture of wrought iron by the puddling process oxidation is produced by melting the pig iron on a bed of iron ore, the latter giving up its to the impurities. It takes about one and one-half hours to eliminate carbon, silicon and manganese as well as a portion of other impurities. Because the heat is not sufficient to maintain a liquid condition the iron is drawn from the furnace in a pasty condition. Thus produced wrought iron is one of the purest of iron and steel products. Wrought iron lacks great strength and cannot be tempered. To produce crucible steel it is melted in crucibles with charcoal or other materials high in carbon, so that the resulting metal contains from 0.75 to 1.5 per cent of carbon. The product is a steel largely used for cutting tools.

In the Bessemer process the pig iron is purified by blowing cold air through the molten metal. The former gives up oxygen and oxidizes the impurities. There are several other processes varying in detail which are largely used. Electricity may be used as a source of heat in the melting of either iron



Induction Motor with Direct-Connected Auxiliary Speed-Regulating Motor Driving 21-Inch Mill.



1,400-Horsepower Motor Driving 28-Inch Sheet Mill.

or steel. By means of electricity, temperatures may be obtained which are impossible to secure with fuel. As the principal interest in this industry lies in the application of electric power rolling mills will next be considered.

Rolling Mills.

To a greater extent than any other mechanical combination the rolling mill has enlarged the uses and cheapened the production of wrought iron and steel. A large proportion of both iron and steel bars are rolled. Nearly all of the members of machines and structures for which these materials are suitable are so designed that they can be rolled or compounded from rolled forms, for this method of manufacture is essential to their uniformity and cheapness. If the direct products of the rolling mill are of unsuitable figure or size, endless modifications may be produced by compounding them.

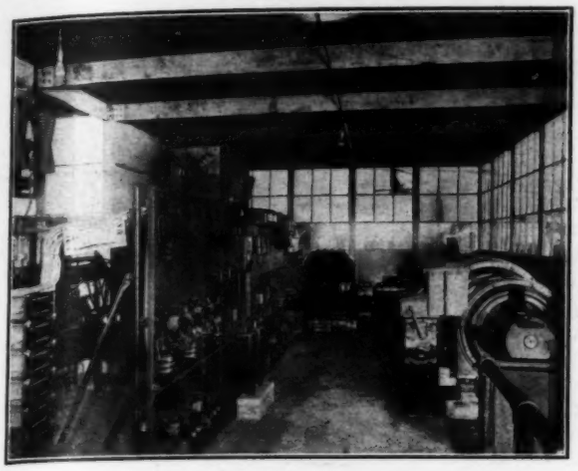
The different forms and uses of rolling mills will be referred to briefly to illustrate the general arrangement. The leading features of improvements have been varied, among which may be mentioned the important one of arranging the rolls to work in both directions so that drawing back the material by hand is eliminated. The matter of power application probably is one of the most important features, and electric motor drive is now extensively used in steel mills. Motors are applied not only independently to the various trains of rolls but to other machines such as saws, punches and shears. The most serious objection to the use of mechanical drive from a central source is the costly maintenance of long lines of shafting and belts. Steam engines were formerly used individually on larger machines, but this necessitated a steam piping system throughout the mill, involving excessive condensation in the pipes with attendant losses. Another objection to mechanical drive from a central source was the expense of running all shafting and belting and a large engine to drive a single machine. Some modern iron-rail mills have eleven distinct motor applications for the following machines: Puddle-train, top and bottom scrap-train, rail-train, saws, two straightening presses, blower, etc.

The driving of separate roll-trains by independent motors is superseding former practice. In the modern system the motor is connected directly to the roll-train. Under such conditions the fewest parts are needed, there is the least lost motion and the greatest smoothness of running, and also a great economy of space. When a particular train is idle its motor and connections are also idle.

The roll-train is the principal machine of a rolling mill. In its simplest form it consists of a two-high mill with plain rolls for making plates. If the top roll is subject to constant vertical adjustment, as in the gradual reduction of boiler plates from thick slabs, it is counterweighted so that it may be held in contact with the screws. When one roll only is connected to the motor, the other roll is turned by the friction of the bar passing between the two. This, however, is practicable for finishing rolls only, where the work is extremely light. In reducing all ordinary shapes the resistance of the uncoupled roll bends the bar and interferes with smooth working. For this reason two pinions, one of which is coupled to the motor, are interposed between the motor and the rolls to impart to them perfectly uniform rotation. The coupling between a pinion and a roll, or between two stands of rolls, seven or eight stands of rolls often being coupled end to end from one set of pinions, is a form of clutch consisting of a cast-iron spindle and two cast-iron rings or boxes, fitting partially over the spindle and the roll-necks.

In a three-high mill the rolls are held at a fixed distance apart. In forming a bar it is often necessary to compress one side more than the other, which together with other causes, tends to bend the bar laterally as it leaves the rolls. For this reason sideguards are employed to deliver it straight. In plate mills, the rolls being of uniform diameter, the same part of the rolls may be used for all passes, the reduction in thickness being produced by decreasing the space between the rolls at each pass; the edges of the plate are not finished. In rolling bars, however, it is necessary to preserve a uniform width and a smooth finish on the sides of the bar; hence the work must be done in grooves. An open groove would allow the metal to squeeze out laterally and form fins. In order to completely close the pass one roll has a deep groove, while a second or companion roll has a collar projecting into the groove of the first roll.

The universal mill consists of a two-high mill standing horizontally and another two-high mill standing vertically, so that four rolls press the bar on all four sides at once. In



Motors and Control Apparatus at American Iron & Steel Company's Plant.

some cases there are two sets of rolls, one at the front and the other at the rear of the horizontal rolls. This mill is very useful for making uncommon sizes of flat and square bars.

The grouping of the machines depends upon the locality, the available space, and the direction from which raw materials arrive and the finished products depart. These conditions rarely prevent a good internal arrangement. The principal feature to be considered is economy in handling the materials used. In a well-arranged mill all materials should be received and all heating done at one end, the rolling machinery should be near the center, and the finishing and shipping should be done at the other end. In a typical mill the gas furnaces are placed near one end and the steel ingots are brought to them on a narrow gauge railroad from the converting works. The furnaces are fitted with an electrically operated machine for pushing in the ingots and for drawing them out after they have been heated.

From the furnaces the ingots are taken to the blooming mill in which they are rolled in 18 passes from 14 inches square to 7 inches square, their length being proportionately increased. The ingot is then cut into two pieces or "blooms," each being long enough to make two rails. The blooms are then picked up by the electric traveling cranes and taken to furnaces for reheating, from which they go to the rail-train. In this each bloom is rolled into a rail in 13 passes, and it issues from the last groove directly upon a line of moving rollers in front of the hot saw. With this saw the 60-foot piece is cut at the middle and the man who controls the saw sends the pieces along by the rollers to the hot bed. Here the rail, while lying on the rollers, is curved between a set of moving arms and fixed stops and is pushed out on either side to cool. The amount of curvature given to the hot rail is such that when it has become entirely cold the longer continued cooling and contraction of the thick head shall not have caused the face of the rail to become concave, but so that it shall be left as straight as possible. The cold rail is then passed through a press for an exact and final straightening and is laid on the cold bed. One ragged end remains to be cut off and for this purpose cold saws are used. These saws are plain iron disks without teeth, driven by motors at a speed of about 2,000 revolutions per minute.

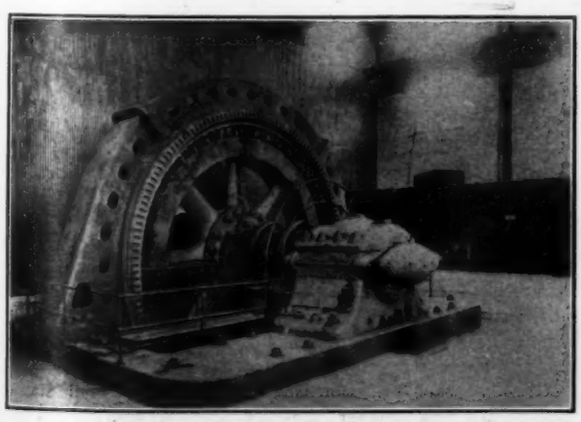
Power Requirements of a Rail Mill.

Following are the power requirements of a steel-rail rolling mill consisting of two trains of rolls, each train composed of two sets. Each set is three rolls high, except the last finishing set which is only two rolls high. Each train is driven by a 230-volt, 1,100-kilowatt, 30-pole direct-current motor direct-connected and equipped with a 125,000-pound flywheel 18 feet in diameter and having a peripheral velocity of 123 feet per second. The mill will roll six rails at a time, producing a complete rail in about two minutes. The capacity of the mill is about 1,600 30-foot, 16-pound rails every 12 hours. An actual test showed that 15 90-pound rails were rolled to 16-pound rails with an energy consumption of 90 kilowatt-hours. The no-load consumption fluctuated between 276 and 410 kilowatts, with an average of about 340 kilowatts. The full-load consumption fluctuated between 750 and 1,200 kilowatts with an average of about 1,100 kilowatts.

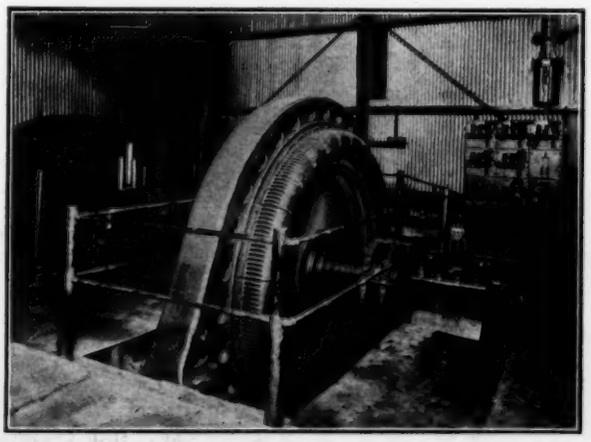
The motor is compounded so that when the load comes on the speed will drop, allowing the flywheel to give up some of its energy that is stored up when the load decreases. In this way the flywheel produces the effect of straightening the load curve.

POWER REQUIREMENTS OF STEEL-MILL MACHINERY.

Application.	Horsepower.
Punch, ¼-inch hole, ½-inch steel	1
Punch, ⅝-inch hole, ½-inch steel	3
Punch, ¾-inch hole, ¼-inch steel	5
Punch, 1-inch hole, 1-inch steel	7.5
Shears, ¼-inch steel	1 to 3
Shears, ¾-inch steel	7.5
Shears, 1-inch steel	10
Shear, 12-inch horizontal	20
Shear, 3 by 3-inch angle	5
Shear, 8 by 8-inch angle	10
Shear, 12-foot gate	30
Coping machine, 24-inch I-beam	7.5
Bulldozer	5 to 15
Beam shear	20
Rotary column planer, 48-inch	10
Plate bending roll	3 to 50
Cleveland straightening machine, 15-inch I-beams	5
Large straightening machine, 15-inch I-beams	15
Beam saw, sawing cold 24-in. I-beams, 2,500 r.p.m.	75
Cold saw, slow speed	5
Universal punch	10
Bradley cushion hammers	2 to 5
Drop hammers	2 to 15
John's beam shear, 10-inch	10



6,500-Horsepower Motor for Driving 60-Inch Plate Mill.



2,000-Horsepower Motor for Driving 30-Inch Bar Mill.

Politics and the Central-Station Company

By GLENN MARSTON

The participation by public utility companies in local politics is a serious question and one that must be considered from many angles in spite of the fact that many municipal-ownership agitations are purely political. Experiences of a number of companies are given in this article, which is the third of a series on municipal-ownership problems by Mr. Marston. Another article will be published in an early issue.

IN MANY municipal ownership agitations the political developments come after the agitation has been started from some other cause. In many others, however, politics is the prime motive behind the agitation, and the purely political agitation is by far the most difficult kind to quell. When a company is attacked politically it has to stand on its past record, and woe to the one which cannot point with pride to its relations with the people.

The politician will, of course, bring in all the other reasons for municipal ownership during his campaign—he will cry out against discriminatory and excessive rates regardless of the facts; he will complain of the poor service; he will bemoan the high-handed indifference of the company's employees, and will tell of the glorious accomplishments of some distant municipal plant concerning which the public can get no first-hand information.

It is the inability and unwillingness of the public to seek first-hand information which makes the political attack so difficult to handle. If the politician makes one statement and the company makes another, the public has a right to believe either one, with the chances in favor of the politician because he can claim to be disinterested, and generally the public does not analyze the case sufficiently to determine his interest.

It is unfortunate that the public cannot be induced to take a more lively interest in public matters, including public utilities. It is a fact that the vast majority of voters have very little interest, if any, in public utilities until some sort of failure on the part of the utility brings it to general notice. Then there will be a flare of interest, and the side which talks fastest and most convincingly is generally the one which gets the public.

Just how much a company should interest itself in politics is a debatable question. There are some companies which keep studiously out of all political relations, and there are others who go to great lengths to court the favor of office-holders. I have been called upon to get some companies into politics and to keep others out—also to get some out after they had fallen in.

I cannot believe that it is right for a company to avoid any interest in politics. The company is too close to the public welfare to warrant it in not taking an interest in seeing that its municipality is properly and efficiently governed. An active interest in public questions, and a definite stand on the side of civic progress, will go a long way toward keeping the company on the right side of the people. It is very generally true that political candidates harmful to the company's development are also harmful to the general public good. This, of course, is not universally true, but it is in the large majority of cases.

It is unfortunate that so many companies are nearly defenseless against political attack because they deserve it. The relations of companies with the government and with the public at large are not all perfect, and it must be admitted that many times the company is to blame.

Some years ago I had to help in getting a company out of politics. It had played the game to the limit—beyond the limit. There was no doubt that the company had not usurped any rights that did not belong to it, but the management appeared to be so afraid of political attack that it became the controlling factor in the local political situation. When the "outs" hit upon municipal ownership as a plan to get in, they had an easy time of it. They wanted a municipal plant so as to get the company out of politics. That was their chief—practically their only—argument, though they also complained, with some justification, of the rates.

The need here was, first, to show that the political activities of the company had not been harmful, and, second, that they would cease. The demand that the company should entirely divorce itself from politics was very strong, and it was really necessary for the company to be "out of politics" completely for a time. Its activities had done the company little good while they lasted, and the management found that it was reasonably safe even when it could not dictate to the public officials.

Good Will of Public Essential.

That this form of political activity is bad need not be said. It is obvious that a company should not play politics for the love of the game or for protection against some remote contingency. It is perfectly true that an unfriendly group of public officials can harass a company to the verge of bankruptcy or beyond, but in order to do this the company's enemies must have public support, and the surest way to teach politicians reason is to have the lesson come through the public. If the people are friendly to the company, the people's representatives will also be friendly; while if the people are unfriendly the politicians must listen to the people first, no matter what their private desires may be. Always, when the company is put on the defense in a political campaign, it must take its case to the people, and influence the office-holders through the people. There is no lasting safety in any other course.

It was only a few weeks after the experience just related that I had to assist a company which had studiously kept out of politics. It had also lost all grip on public opinion, and had paid little attention to the demands of the people. It was out of step with public progress. When demands were made for improvements in service, the company said it could not get the money to make the improvements. The editor of one of the papers wanted to be mayor, and he hit upon municipal ownership as a platform. The time was ripe for it. The people knew nothing about public utilities, save that their own were bad. The company tried to secure a favorable public opinion in three weeks, and failed, though by a surprisingly small majority. After the people had expressed their dissatisfaction at the polls, the company did find the money to improve its service, and the municipal plant was never built. The municipal ownership mayor was elected, and made a good mayor. After all, what he wanted, and what the people wanted, was adequate service, and not municipal ownership. They considered municipal ownership as a means of last resort because the company had been unresponsive to the changed conditions in the city. If this company had been alive to the public welfare, and had taken a reasonable interest in politics it would have known what to do to keep in the public favor without having to be forced into it by a vote of lack of public confidence. The cost of that election would have done a great deal of the work which had to be done eventually anyhow. Not making improvements until they actually were forced upon the company proved to be more

expensive than it would have been to make them a year or two earlier. In other words, the cost of the municipal ownership campaign was greater by a considerable sum than the year's interest which was saved by not making the improvements when they should have been made.

How One Agitation Failed.

In another case where municipal ownership was voted down by very decisive majorities the company had pursued the policy for some time of showing what had been its influence in promoting the prosperity and comfort of the city's inhabitants. In that city there was a professional reformer who had reaped considerable profit from the political influence which he had. For several years he had discussed municipal ownership, but he was not permitted to state his case unchallenged. This reformer has been successful in establishing the commission form of government, and he had been behind the successful movement to purchase the waterworks. It looked as if he had established his influence to the point where municipal electricity was a sure thing. His great mistake was in attacking the company and asking the people to build a plant to drive the company out of business. The company, through the interest it had always shown in public matters concerning the city at large, was able to refute the charges that it was governed by self-interest alone, as opposed to public interest, and, by a straightforward statement of its position, succeeded in securing a vote of public confidence. This vote was not secured without a great deal of aggressive personal work, however. The company's officials secured the assistance of as many of its friends as it could reach, and did not hesitate also to secure the aid of the political enemies of the leader of the municipal ownership movement. There appeared to be no criticism of any of the steps taken by the company to protect itself, though I have seen the same steps very damagingly misinterpreted in other towns where the people were willing to believe anything bad about the company.

Experience of a Southern Company.

In a Southern city the gas and electric company had been subject to regular attacks and threats of municipal ownership every time the legislature met. These attacks were purely political, and the company officials had found that they ceased when contributions were made to party campaign funds. A change of ownership came about, and the new owners felt that campaign contributions were not a proper means of exerting political influence. When the legislature met the same old tactics were in evidence. There was a movement for an enabling act to permit the city to build municipal plants, and there was coincidentally the same old solicitation of funds. Matters were in a delicate condition and there was some difference of opinion as to the right method to pursue. It was decided that there would be no more contributions as in the past, and the agitators were given to understand that the company was prepared to spend all that was necessary in order to defend itself against municipal ownership attacks, but that the politicians in question would get none of it. If they wanted to spend their money on promoting a municipal plant they were welcome to do it, but it would cost them more than they could hope to get out. The agitation was dropped.

College and high-school professors sometimes get political ambitions, and try to realize them through the advocacy of municipal ownership. Such men are quite properly leaders of thought in their communities, and their expressed views are generally accepted with a considerable degree of confidence by the people. When they advocate municipal ownership the people have a right to expect that they know what they are talking about, forgetting that operating an electric plant is quite as much an engineering problem as it is an economic one. In consequence the political professor is a difficult and dangerous proposition. Of course the best way of avoiding such a difficulty as this is to see that the professors are supplied with facts based on actual experience with municipal plants, and that they get this information before they become obsessed with the theoretical benefits of municipal ownership.

Theoretically municipal ownership can be shown to be at least as good as private ownership, with the advantage in its favor as far as theoretical public control is concerned. It is true, however, that there are many cases where theory and practice do not coincide, and the educators in a community should be supplied with such information as will enable them to view both sides of the case without prejudice. It is my own opinion that if an educator can be induced to do this he will not be a rabid advocate of municipal ownership, except as a last resort in disciplining a company which is not fulfilling its duty to the public.

It is highly important to the central-station industry that the vast majority of companies, which are giving adequate and satisfactory service to the public, should not be hampered and have their investments endangered by the shortcomings of the minority of companies which are not performing their duties in a creditable manner. It is the bad ones that the public hears about, and sometimes all companies are accused of misdeeds which belong to a very few companies.

Explain Position to the Public.

Just as the vast majority of people who keep out of jail do not get their names in the papers, so the good companies are accepted as the commonplaces of life. Only when they are remiss do they become subject of voluntary public discussion. But the advertising columns of every newspaper are open to the demonstration by the company of the tremendous, though unnoticed, part which it plays in contributing to the growth, prosperity, and comfort of the people. There are countless interesting facts concerning the company which never come to public notice except in this manner, and the companies which have made themselves known because of their progressiveness are the ones which have the least trouble with politicians and their followers. It must be remembered, however, that deeds and words must go together, and death-bed repentance is seldom accepted at its face value.

There is something wrong with the company which waits to be told what the public wants. Public utilities are supposed to be monopolies, yet there is always keen competition in every branch of its business. If street-car service is good, there is less need of automobiles. If power is cheap and reliable there are many steam and gas-engine plants which can be abolished. If electric light is reasonable in price and satisfactory in quality there are still a great many oil lamps to be put on the top pantry shelf. The users of these various items are not unwilling to use electricity—on the contrary they are anxious to become customers if some apparent obstacles can be overcome. The company which overcomes these obstacles will not only be secure in its favorable public opinion, but will increase its revenue at the same time. The days when the cream of the business can be skimmed and the rest left are past. Every year sees the broadening of the duties expected of public utilities, and the private profit almost invariably increases in proportion to the public spirit and public service performed by the company.

Central-Station Company Loans Window Space to Local Merchants.

At Middlesboro, Ky., the Kentucky Utilities Company is varying its window display by turning its space over to local merchants on alternate weeks. Electrical appliances handled by the company are shown one week, being succeeded on the next by displays arranged by photographers, dry goods and other merchants.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

ADVERTISING CAMPAIGN FOR HOUSE-WIRING A NOTABLE SUCCESS.

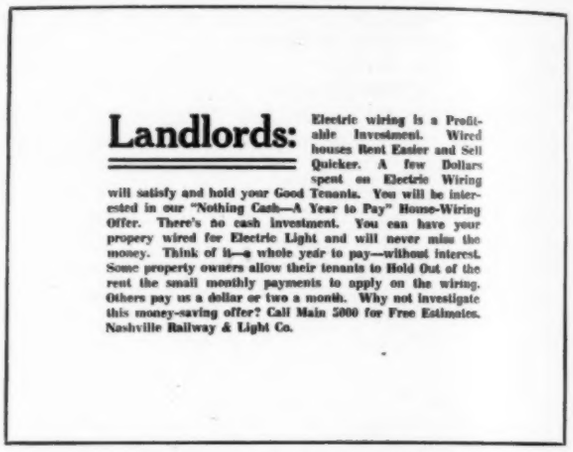
Nashville Railway & Light Company Secures 1,061 Orders As Result of Activity During Rent Season.

A vigorous campaign conducted by the Nashville (Tenn.) Railway & Light Company to persuade prospective tenants to consider only houses wired for electricity and present tenants to require landlords to wire the houses resulted in the signing of 1,061 orders for new connections. This campaign was conducted during the recent renting season, because of the fact that practically all leases in that city expire on October 1. During September the lighting sales department was occupied in preparing for the business involved in the moving of tenants on a large scale, while in October it was conducted at high speed to handle these changes and the new business it produced.

The advertising campaign began about six weeks in advance of moving day. It was directed at both landlords and tenants and consisted chiefly of street-car and newspaper announcements. A typical "landlord" advertisement reminded members of this group of the fact that wired houses are easier to rent and that it is better for him to wire for a tenant already in than to take chances on a vacancy, when he would also have to make far more expensive improvements—and have to wire in the end. Tenants were advised that the landlord would be willing to wire as an inducement to signing up a new lease. The suggestion was also offered that it was far better to rent a wired house than one without electricity.

Tenants:
Tell your Agent or your Landlord that you will sign up NOW for next year—if he will wire the house for electricity.
Nearly any wise agent or property owner will wire his property if he knows that his tenant wants Electric Light.
Agents and owners know that good tenants insist upon Electric Light. They would rather "wire up" for you than to have you move out—and have to "wire up" before any other good tenant would even look at the house.
Be sure to tell him NOW—that you MUST have Electricity. He will want to take advantage of our Special WIRING OFFER.
MAIN 5000 FOR ESTIMATES.
Nashville Ry. & Light Co.

Advertisement Directed to Tenants.


Landlords:
Electric wiring is a Profitable Investment. Wired houses Rent Easier and Sell Quicker. A few Dollars spent on Electric Wiring will satisfy and hold your Good Tenants. You will be interested in our "Nothing Cash—A Year to Pay" House-Wiring Offer. There's no cash investment. You can have your propery wired for Electric Light and will never miss the money. Think of it—a whole year to pay—without interest. Some property owners allow their tenants to Hold Out of the rent the small monthly payments to apply on the wiring. Others pay us a dollar or two a month. Why not investigate this money-saving offer? Call Main 5000 for Free Estimates.
Nashville Railway & Light Co.

An Advertisement That Interested Landlords.

A typical street-car card was as follows: "Why go another year putting up with poor, out-of-date lighting, now that electric light is so cheap and electric wiring rates so reasonable? Now, before you sign up, is the time to settle the question." Another car card was as follows: "When you see For Rent be sure it is wired for electricity."

Another effective device was a large red tag, for use in houses just completed and in those vacated, already wired, as an aid to attracting the attention of prospective tenants or purchasers. The tag is hung on a chandelier or other conspicuous place by a member of the sales department. On one side are the words: "Use electric light, it is clean, safe, convenient, economical. The owners of this building have expended a large amount in providing electricity for your comfort and convenience. We want you to be one of our customers."

The other side gives directions for the use of an attached postcard. This postcard, already addressed, directs the installation of a meter or the sending of a salesman. This makes it easy for prospects to follow up the suggestion given by the card.

That there was a big demand for wired houses is shown by the fact that out of about 1,500 homes in which changes were made, only 211 meters were removed as a result of homes or apartments being left vacant. Of these more than half were re-secured in new apartment houses. This also indicates that few were lost to any other form of illumination.

The new-business department of the company secured 3,198 orders during the two months of the moving season. This included both new customers, successor orders and a large number of increased business and appliance orders. The sales department made nearly 7,000 calls during these months, of which nearly 5,000 were the direct re-

sult of removals, some of these being repeated trips in order to watch vacated premises for successors.

The concentration of handling nearly 10 per cent of the total number of residence consumers in a period of less than two months is of course a big strain. As a result the company was glad to enter into concerted action with real-estate agents and other interests involved to bring an end to the "moving-day" evil. One step in this direction had been taken by an agreement to permit leases to be taken from any date, so that all leases will not expire simultaneously in the future. It is expected that Nashville has had its last big moving day. This will put an end to the evil of having the work of meter changes, closing and opening of accounts, special meter readings and other operations in large volume concentrated at one season, and this change will be greeted with relief by the lighting department. Electrical wiring contractors will also be pleased, as it has been necessary to finish all construction before October 1, as there was little chance to rent a house or apartment after that time.

Mr. Landlord:
Will you spend a few dollars on Electric wiring and give your present tenant Electric Light—if he will sign up now for next year?
It will be cheaper to "wire up" now—and hold a good tenant—than to
—re-paint
—re-pair
—re-paper
and "WIRE UP"—before you can get another good tenant.
Good tenants demand Electric Light. No home is modern or complete without it. Electric wiring is a profitable investment.
Investigate our REDUCED WIRING RATES and EASY PAYMENT OFFER. Main 5000 for information and estimates.
Nashville Ry. & Lt. Co.

Considerable Business Was Attributed to This Advertisement.

Rates to Be Reduced in Birmingham.

A reduction of more than 5 per cent in its rates for electricity will be made by the Birmingham Railway, Light & Water Power Company if approval is made by the Alabama Public Service Commission. The company voluntarily filed the schedule.

PROMOTION OF APPLIANCE SALES BY CENTRAL-STATION COMPANIES.

Some Suggestions for Holiday Business Presented By C. E. Yacoll Before the Ohio Electric Light Association New-Business Meeting.

In this prosperous year, there exists an opportunity for central stations generally to increase their retail sales and the revenue from residence customers such as never existed before.

The mere fact that users of electric service are increasing so rapidly and their knowledge of the genuine usefulness and desirability of electric housekeeping appliances has so widely expanded, is sufficient in itself to prove the statement, but added to the field that exists for the sale of current-consuming devices and the growing appreciation that people have for them, is the more pertinent argument for extra effort on the part of all of us just now that everyone has plenty of money to spend for those things we teach them to want. Do not take it for granted that everyone knows all about all the different articles you may sell; there are doctors in your town, as an instance, who know nothing of electric heating pads and they are in a position to prescribe their use almost every day.

Central stations have certain electric wares which for three very good reasons they want to sell,—for direct profit, for the ultimate profit from the sale of increased amounts of current and which is most desirable because as a rule it does not call for any increase in the facilities necessary to serve the customer, and for the dependence that users of satisfactory appliances must come to place in electric service. You have already convinced yourself that these articles you have for sale are useful to certain people under certain conditions, or rather, to all people under some condition. Now, given a stock that you know is right and a public you know has money and with the added knowledge on your part that this public will at this particular season of the year spend this money with more or less freedom, it is strictly up to the central-station booster to plant the thought of usefulness in the mind of this public who are going to buy so much to give to some other part of this same public. And this very idea of usefulness is the thing that is going to swing a great tide of business toward the dealer in electric appliances, provided, of course, he does his part, which will be to see that the buying public becomes acquainted with the idea.

Preach the giving of sensible gifts. Urge givers to give the things they themselves would like to receive. The thought could be made to serve as a good selling slogan for the Christmas campaign—"Give the gifts you would like to receive." If this idea is ever really put across and practical gifts become the rule, it is going to go hard with certain lines embracing pickle forks, sardine spears and pin cushions, but Henrietta Jones, who needs and wants an electric flat iron, will get one from some of her sensible friends who will give it to her because they for their own part would rather get as a Christmas gift a homely but usable flat iron or heating pad rather than some delicate article of rare use. The man of the house may receive an electric auto heater instead of the usual box of cigars or the stick pin that married men especially most always get, but he would, no doubt, prefer to buy his own cigars any way. Possibly the children will chip in and get mother an electric washing machine, or a sewing-machine motor, and you can guess as to the relative merits, in her eyes, of such an article and some of the things you may be sure she has received in the past. Wherever your directory shows a number of people at the same address and of the same name, see if it is not a family of children who can be persuaded to buy for their parents some one or other of the useful things we have to sell, with a resulting degree of satisfaction all the way around that may

not have been experienced in other years of giving. Go after the auto owners of your town on this heater proposition mentioned before. Don't try to sort out the consumers.

Talk of the vacuum cleaner as the gift of the entire family and then, of course, prove that it will be so by telling them of the comfort and healthfulness of a dust-free house in which they will all share. Call attention to the comfort for the ill and aged contained in a heating pad or any one of the many good electrical heaters. Tell the fathers and mothers that electric toys are safe and instructive and, in general, advise the giving of gifts that have a 365-day usefulness throughout the years.

The foregoing mostly concerns the advertising that central stations are to do, which, if it is done along common sense lines, will create the interest in electrical gifts that will be followed up by a visit to the store for further information or for buying. It is true that good advertising with the price of an article will make frequent sales in itself, especially during the Christmas rush when so many people, men particularly, do all their buying in an evening session with the newspaper, but a lot of people will come to the store to learn more of the things of which you have told them or to check you up on the statements you may have made as to the worth and desirability of the articles you have for sale. Don't disappoint them. Have the things in stock that they want to buy. Remember that this is going to be a big year and load your stocks accordingly.

Experiences of Ohio Central Stations.

The question was brought up here whether the appliance department of the central-station company should be so operated as to secure a profit on the goods, or whether the goods should be regarded as current-consuming devices only, and sold accordingly. The opinion was unanimously expressed by several who made remarks on this point that list prices should be maintained, and that good merchandising methods should prevail in the matter of prices as well as in other respects. Special allowances on old equipment to be replaced with electrical goods, such as water-power washing-machines, irons, and so forth, were held to be legitimate, but aside from this price reductions should not be made.

Mr. Yacoll stated, in this connection, that the Youngstown electric shop sells all appliances at list prices, and that the volume of sales is all that could be asked, so that from the standpoint of the current-consuming power of the purchaser good work is being done. He stated that the average revenue from lighting consumers has increased from $15 in 1910 to $21 last year, and that much of this increase is to be attributed to the increasing use of current-consuming devices of the sort sold in his department. The sale of 41 electric washing-machines in one month was cited by him as an instance of the way the goods move under favorable conditions, without outside solicitation.

The collection plan which seemed to be most approved, being in use by a number of companies, was the payment of 10 per cent cash, and the remainder at 10 per cent a month, with a five-per-cent discount for cash, and a lease or chattle mortgage on the article sold to secure the payment of the balance due.

Mr. Connor, of Youngstown, stated that on a plan of sending out electric irons on approval for 15 days, and billing the customer in case the iron is not returned, 5,000 irons have been sold in a year, of which only three were brought back and four were not paid for. All irons are repaired free of charge, not only as a matter of service but to bring people into the shop, Mr. Connor stating that close tab kept on this work showed that a great many people bringing in their irons for free repairs bought lamps or other goods, simply to demonstrate their good-will.

A vacuum-cleaner campaign which resulted in the sale of 580 machines, at $32.50 each, in 30 days, was referred to by H. B. Craft, of Columbus. Advertising in the local papers twice a week and the use of street-car cards, with hard work by the sales force, produced these results. A house-to-house canvass by the salesmen did the work, being largely responsible for the success of the campaign, Mr. Craft said.

Mr. Lemon, of Toledo, gave figures showing a remarkable growth in his company's appliance business for the holiday season. He stated that the month of December in 1912 showed sales of $1,500; 1913, $4,000; 1914, $17,000, and 1915, $44,000. In 1914 20 salesmen were used, and last year 24 were on the force, with a mark of $50,000 for the month to aim at. This year Mr. Lemon said that he has set $75,000 as the volume for December, and that he expects to come very close to getting it. Sales of 344 Hoover cleaners in March, and of 133 of the same in October, from the eleventh to the thirty-first, were cited by Mr. Lemon as instances of what can be accomplished by a vigorous campaign.

The payment of liberal commissions in order to get and keep good salesmen was strongly brought out, one schedule of price-fixing being the addition of 12 per cent to cost, as an allowance for overhead, with 40 per cent to the salesman out of the remainder. Such salesmen, it was pointed out, can not only sell goods, but make friends of a valuable sort for the company employing them, so that they can if necessary secure signatures to petitions, and similar work.

Mr. Lemon said that in Toledo his salesmen have their own exclusive territory, in which, as he put it, each man is king. This system enables each salesman to become thoroughly familiar with the people living in his district, and to work the territory intensively, with excellent results. The example of one man was cited, who has a residential territory, and who averages $1,800 to $2,000 a month gross sales, calling on everybody in the neighborhood he happens to be covering, without missing anybody. The men are all expected to cover their territory completely every six weeks.

In this connection an extremely interesting discussion of the value of advertising, especially newspaper advertising, came up. Mr. Flower, of Cincinnati, commented on the experience he has had with advertising, finding that in some instances it seems to be entirely ineffective, as far as tracable sales are concerned, while in others results are very good. Chairman North remarked that in a certain instance, where a campaign to interest prospects in an electric vehicle was planned, the amount available, about $280, could be spent to much better advantage in direct solicitation than in advertising.

Mr. Acuff, of Massillon, here gave some highly practical instances of his own advertising experience, which he indicated inclined him very favorably toward newspaper publicity. He said that in a city of 16,000 he had sold $41,000 worth of appliances in eleven months largely as a result of newspaper advertising, increasing business in three years 460 per cent in lighting revenue and 700 per cent in power revenue. He cited the recent sale by his company of $95,000 of a preferred stock issue of $125,000, by means of newspaper advertising, and pointed out that as the sales were for the most part in small lots of five and ten shares, they represent a widespread distribution of financial interest in the company which has a high practical value. He said that front-page advertising space was used, by special arrangement, and that voluntary and favorable editorial comment on the merit of the company and its securities was made in the paper.

Secretary Gaskill, of the Association, contributed a few remarks on this subject, strongly supporting the view that newspaper advertising pays in a number of ways. He said that while the man who expects to get back ten dollars for every one spent in advertising will be disappointed, such expenditures will prove good investments even where direct results cannot be found. He pointed out that the central-station company is usually the only one in a municipality, and that this is usually responsible for an inimical attitude on the part of the public, which regular advertising goes far toward removing, and that when the time comes that the company

either wants something from the people or is unjustly attacked, its paid advertising on the subject in hand will be much better received if it has advertised regularly in the past.

Mr. Connor stated in this connection that he had obtained permission from a number of users of a washing-machine sold by him to advertise their names as references, and that 27 sales resulted directly from this particular advertisement.

Chairman North made it clear that he was not opposed to advertising, believing it rather to be a business necessity, for a good many reasons, but that in handling certain phases of selling, such as that he had referred to, other means of moving goods might prove more satisfactory and effective.

Eureka Rate-Case Decision Upholds Present Tariff.

The Railroad Commission of California has handed down its decision in the rate case of the Western States Gas & Electric Company, Eureka, Cal.

As in the San Diego case, the Company's rate schedules are substantially upheld as fair and reasonable. Slight reductions in each step of the electric rate schedule for lighting purposes are ordered, while slight increases in the schedule covering electricity for power are declared necessary.

There is no material change in the first block of the gas rate schedule but reductions are made in subsequent steps. The minimum monthly charge of $1.00 per meter per month for gas service is retained, also for electric service; and the minimum charge of 75 cents per horsepower per month for power installations of less than five horsepower has been increased to $1.00 per horsepower per month.

Aiding the Electric-Car Industry.

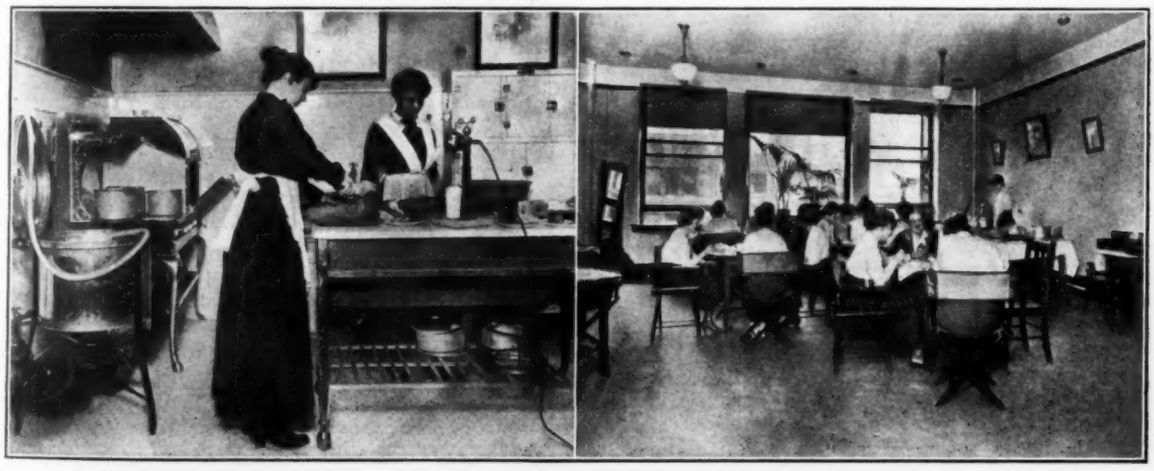
"Say a good word for the electric car" was the gist of a suggestion made at a meeting of the Louisville Jovian League by George G. Bader, former president of the Electric Garage Company, of Louisville, and now making preparations to establish a central electric garage in that city.

"When friends come to you as electrical men," he said, "and speak to you, as experts, about automobiles, you can afford to say to them: 'Why don't you investigate the electric car before you buy?' It would be good for the whole electrical fraternity. And you can feel sure that the electric car is just as much better than the electrics of eight and ten years ago as the gasoline car of today is better than the gasoline car of that day. The only difference is that people seem to judge the electric by the standards of eight and ten years ago, while the latest gas car is the standard in that field. The reason probably is that the electrics which were put into service eight or ten years ago are still running on the streets, while the gas cars of that date are gone altogether. So, when automobiles are up for discussion electrical men should put in a word for the electric car."

Druggists Enlisted in Fixture Campaign in Nashville.

As a part of its plan of celebrating America's Electrical Week, the lighting department of the Nashville Railway & Light Company has made contracts with 30 suburban druggists for displays of electrical fixtures for a period of two months, November and December. The contract provided not only for the use of part of the store for display of appliances, but each druggist agrees to rent a store-front lighting fixture for two years. This fixture consists of a ball-globe, with the name or other advertising device painted on, and with a minimum size of 300 watts. This is to be the beginning of a "drive" on the sale of these fixtures and it is thought that each druggist will be the center for a number of sales in his neighborhood. The druggist is given a commission of 10 per cent on his electrical sales during the two months and is also given a rebate of 25 per cent on his lighting bill during this period. This is considered a good way of arriving at the proper rental for the space, as a store with large consumption has usually a good location from a sales standpoint.

A Co-operative Electric Cafeteria



The New York Edison Company is carrying on an interesting experiment in the form of a co-operative electric Cafeteria. The term "experimental" seems hardly applicable, for the plan is well past the experimental stage and has taken its place in the regular daily routine of the young ladies employed in the Forty-second Street offices of the New York Edison Company. It has met with the enthusiastic approval of Arthur Williams, general commercial manager, and is carried on directly under the auspices of the Bureau of Home Economics, of which Miss Anne Broome is manager. The electric apparatus used in the preparation of this Cafeteria luncheon consists of ranges, grills, a coffee urn, tea kettle, a waffle iron, cake and egg mixers, an ice-cream freezer and a warming oven. Also of great importance in the little culinary department is an electrically operated refrigerator and a dish washer. The preparation of food is, in fact, a daily demonstration of the practical use of electrical cooking apparatus, and visitors are always welcomed to these demonstrations. The scheme is so conducted as to be entirely self-supporting and more than 30 girls participate in it. The cost of a luncheon ranges from 15 cents to 35 cents, according to a girl's appetite and taste.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

THE ECONOMY OF SOLID WOVEN BELTING FOR MOTOR DRIVES.

By W. F. Schaphorst.

On account of the very high cost of leather at the present time, the price of leather belting is becoming almost prohibitive. Leather is a very good medium for transmitting motor power. It has established efficiency records as high as 98 per cent in actual tests. It is strong, tough, elastic, can be made into endless belts with comparative ease, and is especially good on drives where the belt must be shifted back and forth from pulley to pulley very often.

But in spite of these good features, leather belting has its faults. It is everlastingly stretching, and unless properly cared for is affected by moisture, heat and cold. It cracks, and it grows hard and stiff on drying.

There is no good reason, therefore, why belt users should not look to some other source for belting and, if possible, get a less costly and better belt.

The solid woven belt is rapidly forging its way to the front as the "solution of the problem" for the sorely oppressed belt user and buyer. Let us look into the matter for a few moments and consider the economies of this new usurper of the belting field:

In the first place most belt users have not bought belts correctly anyway. Much money could have been saved on leather belts by selecting the most economical combination of belt and pulleys.

Too many belt men and belt-drive designers have been in the habit of "sizing up" a machine with the eye and concluding off-hand that "a —— inch pulley will do the trick." Such a conclusion is no more or less than a blunt guess, but the guess "goes," the pulley is installed, and thereafter the belt man may or may not have trouble. It is principally a matter of luck as far as the belt man is concerned.

Pulleys must not be too small, because small ones are liable to slip easily; and they must not be too large, because large pulleys are expensive. Both belt and pulley must be just right.

Now, it is "up to you" to get the "just right" combination, whether the belt is to be leather or solid woven, and here is the way to go at it:

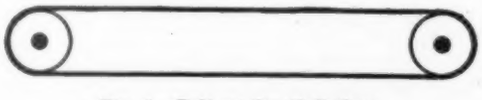


Fig. 1.—Belt on Small Pulleys.

Small pulleys require a wide belt—at least a wider belt than a large pulley transmitting the same power and running at the same speed. Large pulleys, therefore, can be run with a comparatively narrow belt. Do you get the point before I explain further? It is extremely simple to show.

Fig. 1 shows a belt on small pulleys, the distance between pulleys being 30 feet. This drive costs *more* than the driven shown in Fig. 2, although in the latter we have pulleys *twice as large* as those shown in Fig. 1. Do you get the secret now?

In Fig. 1 the belt costs too much. It is too wide and heavy. In Fig. 2 the belt costs only one-half as much because it is just one-half as wide as the belt in Fig. 1.

It is now plain that something is "up to you" in making the selection of belts and pulleys. A little figuring must be done in order to sift the whole thing down to the most economic size.

Fig. 2.—More Economical Drive Than Shown in Fig. 1.

First, do just what is usually done—"make a guess" at the size of the smallest pulley. That is, what do you "think" the diameter should be?

To guess intelligently, the speed of the small pulley must be known, of course. If it is a pulley on a motor, how many revolutions per minute does the motor make? Also, how many revolutions per minute must the driven pulley make? The diameters of the pulleys will be inversely proportional to these speeds, i. e., a one-foot pulley of a given drive would make 4,000 revolutions per minute if the four-foot pulley to which it is belted makes 1,000 revolutions per minute.

Choose pulleys of such size that the speed of the belt will not be greater than a mile a minute. Steel pulleys may be safely run at 6,000 feet per minute peripheral speed.

You are now ready to compute the width of the belt, which is easily done for leather belts as follows: A single leather belt one inch wide running 800 feet per minute will transmit one horsepower. And for other thicknesses use 500, 400 and 300, respectively, for two-ply, three-ply and four-ply.

For solid woven belting a prominent manufacturer gives the following rules:

"Single" is equal to single leather. "Light-double" is equal to extra-heavy-single or light-double leather. "Regular double" is equal to double leather. "Triple" is equal to triple leather.

Thus, before passing into the next phase of the subject, is a very good showing for woven belting. The rules, you see, are about equally applicable to either leather or solid woven belting.

Now, knowing the belt width, you can easily decide on a pulley width. Generally, the pulley is about one inch wider than the belt. It does no harm, to be sure, to use pulleys of even greater width, but never use pulleys that are narrower than the belt. Once in awhile we see such drives, but they should never be tolerated.

We must next find the total cost of the belt and pulleys, and in order to do that we must know the length of the belt. To find the length of the belt, multiply the diameter of the small pulley by 1.57, multiply the diameter of the large pulley by 1.57 also, multiply the distance between shaft centers by two, and then add all of these products together. The sum will give the belt length

closely enough for most computations, although it is not always absolutely accurate.

You now know everything except prices. Prices, of course, are given in transmission catalogs or must be obtained specially from the manufacturer, if of a fluctuating nature.

Next, choose a larger diameter for the small pulley and do the above computing all over again. Perhaps the total cost of larger pulleys and a narrower belt will be less, perhaps more. You cannot tell until you try it out.

If the cost is less, try a still larger diameter for the small pulley, always remaining within the allowable belt speed.

If the cost is more, in either of the above trials, choose a smaller pulley and try again. After doing the computing once it is easy to do it several times in succession, for then all you have to do is to perform each operation in the same way except that different figures are used each time. It is wise, generally, to tabulate your results systematically in this way for the avoidance of errors:

Diameter of Pulleys, Inches. A	B	Width of Belt, Inches.	Width of Pulleys, Inches.	Length of Belt, Feet.	Cost of Pulleys, Dollars. A	B	Cost of Belt, Dollars.	Total Cost, Dollars.
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This table tells the whole story in a condensed form. The final column, "Total Cost, Dollars" is the important column. The least total cost, generally, is the most economical where the distance between shaft centers is 20 or 30 feet. Where pulleys are close together, however, judgment must be used in addition to figures.

Usually this method gives amply large pulleys—larger, in fact, than you would use on "guessing" the diameter with your eye. Large pulleys are generally best.

The above reasoning applies equally to leather and solid woven belting, but on account of the much lower cost of the latter it is plain that woven belting has an even greater advantage where the distance between shaft centers is great. At *any* distance, though, woven-belt drives cost less.

To show this great difference in cost I quote the following from a letter which I have in my possession: "Recently, on a new installation in a big East End plant, they figured leather belting would cost them $3,500. Comparing cost of solid woven belting for the same installation, it showed a saving of just $2,218.40. Ours cost only $1,281.60 and the conditions were such that we could guarantee our belting to give them just as good service as the best grade of leather."

This same manufacturer of woven belting has a novel way of advertising "free pulleys" with his belting at a cost less than leather would cost. You can see how he does it. He follows the above method of selecting the best and most economical drive, which is the modern way of doing business. He does not sell so much belt with large pulleys, but his belts do good work and future sales are all his—another modern business method.

Again, this same manufacturer will not sell a belt if he knows "finger shifters" are to be used. "Usually," he says, "the belt is blamed instead of the finger shifters, when the belt wears out prematurely." His idea is the saving of the reputation of his belting. Do you blame him? The old finger shifter should be tabooed. It is hard on any belt to allow it to scrape against a sharp object. A broad surface should be used to press against the belt—not a sharp edge. This is just good common sense.

It is claimed by some belt men that they cannot make a good joint in a solid woven belt, but that is because they go at it in the wrong way. Being accustomed to leather belting we are inclined to try to join woven belts in the same way, but that is illogical, because of the difference in structure of the belts.

Some of the new metal lacings and joints do satisfactorily on solid woven belts and some belt men are successfully making woven belts endless. Information of this kind can be had by consulting the manufacturer of the belting.

There are other advantages that accompany woven belting such as less pressure on the bearings due to the larger pulleys and lessened tension; power is saved; bearings and babbit metal are saved; there is less slip and less belt wear; and the goodness of the belt runs all the way to the output which is increased and improved.

Noteworthy Efficiency of an Electric Pumping Installation.

A letter describing the wonderful performance of an electric pumping installation operated by the Vindicator Consolidated Gold Mining Company, Canon City, Colo., and served by the Arkansas Valley Railway Light & Power Company, has been received from W. N. Clark, superintendent of the Mountain Division of the Arkansas Valley company. A part of the letter is quoted herewith:

"The Vindicator Consolidated Gold Mining Company has installed in the bottom of its Golden Cycle shaft three horizontal triplex Deane pumps. Each pump is driven by a 85.5-horsepower motor, running at 600/300 revolutions per minute, connected through flexible couplings to herring-bone gears. The pumps are lifting about 600 gallons per minute, a vertical distance of about 1,800 feet. These pumps were installed in 1912 and have run continuously. A centrifugal pump is operating below the three plunger pumps in a sump below the pump station and delivers water to the plunger pumps. The over-all efficiency of the plunger pumps was carefully measured and was found to be 83 per cent from the switchboard on the surface to the water discharged at the surface. The guarantee of motors and pumps combined was 76.5 per cent.

"These pumps drain a small section of the Cripple Creek gold mining district. The main portion of the district is being drained by the Roosevelt tunnel, which is now 22,000 feet long. The section from which the pumps are taking water is separated from the main district by a dike of dense material, which does not permit the water to drain through. However, the Golden Cycle shaft pumps are now pumping from an elevation lower than the Roosevelt tunnel."

Another Electric Furnace Installed in Stockton.

The Western States Gas & Electric Company, of Stockton, Cal., has secured a contract with the Samson Sieve-Grip Tractor Company for electric energy to operate a 0.75-ton electric furnace. This is the second electric furnace installation in this city, the first being installed several months ago at the Monarch Foundry Company, which is also served by the Western States Company. Other new business recently secured by the Stockton division includes a large power installation for the operation of the gold dredger for the Natomas Company, which sank in its pond in the spring.

Minneapolis Company Secures 2,000-Horsepower Contract.

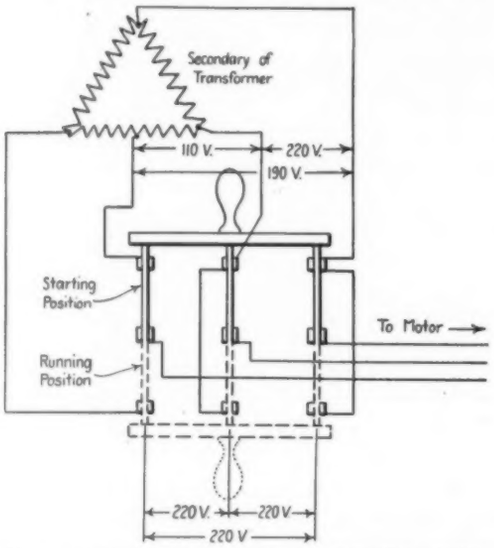
A contract has recently been closed by the Minneapolis General Electric Company, Minneapolis, Minn., involving an installation of 2,000 horsepower in motors for the Soo Line terminal elevator in Minneapolis. The elevator has a capacity of 1,200,000 bushels.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Simple Induction-Motor Starter.

In starting up a five-horsepower three-phase induction motor we had trouble in that the motor would invariably throw off its belt, unless it was very tight, in which case it rapidly wore out the bearings. I wired up a starting switch in the



Simple Arrangement for Starting Induction Motor.

manner shown. It was possible to connect to the middle point on one side of the secondary of the three-phase transformer. In starting, the switch is thrown up, thus giving reduced voltage on two of the phases. As soon as full speed is nearly reached, the switch is thrown down, giving full 220 volts on each phase. Although the starting voltages are unbalanced, the motor starts quite satisfactorily and not so violently as before.

Harry Dean.

Billing of Extras in Addition to Unit Prices by Contractors Condemned.

In a circular letter issued to members of the Massachusetts Electrical Contractors' Association by J. E. Wilson, its special representative, the practice of small contractors in out-of-town localities in quoting on lighting installations at low unit prices and then making up for the low price by charging separately for service connections, cabinets, cutouts, and other extras is severely condemned.

A case is cited in which several contractors figured on an installation of about 100 outlets, the prices quoted being between $3.00 and $4.00 per outlet for the work complete. Several other contractors, who make a practice of quoting a rate per outlet on a portion of the work, named $1.00 to $1.25 per outlet, and one of them secured the contract. In billing the work, added charges were made for service connections, service switch, cutout cabinets, switches, bell work, and sundry miscellaneous equipment, which actually brought the cost of the work up to a price about 20 per cent above the quotation of contractors who figured on the job and then quoted a lump sum.

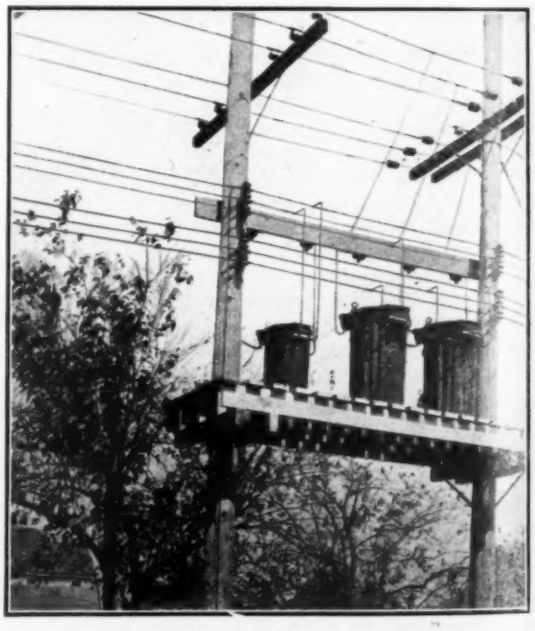
The letter calls attention to the irritation which a customer is bound to feel as the result of such a practice, and points out that the effect upon the industry as a whole cannot be other than very harmful. Members of the Association are asked to suggest remedies for the evil, which "has a tendency to reduce the volume of work of the contractors, as well as lowering the standing of the contractor in the community."

Forbids Electrical Licenses to Representatives of More Than One Concern.

The Board of Electrical Control of Atlanta, Ga., has prepared an amendment to the electrical license ordinance forbidding the use of a license by a single technical man to cover a number of business concerns. This was done after an application was made by an electrician for licenses for five companies of which he was the only technical man. The amendment states that the person in charge of the work covered by the license shall not be authorized to serve in like capacity for any other individual, firm or corporation so licensed.

A Transformer Rack Which Makes Work Easy and Less Dangerous.

The accompanying illustration shows a transformer rack which is being used to a large extent by the Texas Power & Light Company where secondary voltages are used on power installations. This rack, which is made simply with two



Roomy Mounting of Transformers.

poles and a platform, provides a secured resting place for the transformers and at the same time makes it easier for a man to work around the installation when it is necessary to replace fuses or make other changes.

Installation of Farm Lighting Plants

Sale and Installation of Rural Electric Plants with Necessary Wiring of the Premises Can Prove an Avenue for Profitable Business for Wide-Awake Electrical Contractors

By GEORGE W. HILL

DURING recent years a great educational campaign has been going on throughout the country that has been far reaching in its scope, and has produced results far beyond the most sanguine expectations of those who have been putting forth what have no doubt seemed to the casual observer to be useless efforts. But not unlike many other educational campaigns, which have had for their ultimate aim the betterment of living conditions and a higher American ideal, it has occasioned the expenditure of thousands of dollars and much energy and thought on the part of those men of high ideals and sacrificing natures who have hoped that living conditions on the American farm might be so improved as to induce the younger generation to remain there and that the "Back to the Farm" movement might become more interesting to our people, who have for years flocked to our cities. These men have been broad enough to see and realize that this is the solution, to a large extent, of the "high cost of living," and many other economic problems which confront us as a nation.

Demand For Electricity on the Farm.

Electric light today is recognized as one of the essentials to comfort and convenience on the farm. The farmers are making more money today for the same amount of time and energy expended than any other large class of men, and they have become awakened to the need for more liberal improvements for the better.

The automobile, the telephone and the rural free delivery have all played an important part in this great campaign. Some few years ago electricity was a stranger to the farmer. There was practically nothing which entered into the daily life which contained the element of electricity, and little or nothing was understood of it. It then seemed to be something to be enjoyed by the city folk, and only to be dreamed of by the farmer and never to be realized. Farms in the Far West and Middle West have ben large, so that great distances have practically isolated the rural dwellers from the towns and from one another. But today (thanks to the automobile and telephone), it is nothing uncommon to hear a farmer refer to "his neighbor" living some 20 miles distant.

Farm Service from Transmission Lines Usually Not Profitable.

While the distance has been shortened in time, the actual distances over which electric transmission lines must be carried between farms and communities have not materially changed, except in a very small degree, as the tendency among the farmers increases to bring the soil to a higher state of cultivation, and to farm less land better. Consequently, in many sections it has not been practical to extend transmission lines to where they could serve a large majority of the farmers of the country, as the cost of installation and maintenance has been altogether too great to induce capital to invest in any except such transmission lines covering a comparatively small area, where a large amount of energy could be sold.

There was a period when farmers were renting their farms and moving into small towns, usually nearby. This was due largely to the fact that the great inventive mind of the ingenious Yankee had been so engrossed with the object of producing developments which would reduce the cost of manufactured articles, that those who were really inventors of note were in great demand in industrial lines; they were besieged, as it were, from all sides to relieve the situation here and there in the production of this or that article, and had not as yet turned their attention to those things which would better living conditions on the farm. The farmers were, consequently, flocking to the city to avail themselves of those things which made living more comfortable and cheerful. In recent years, however, some of the greatest inventors of the age have heard the call, and today in many farm homes will be found every convenience enjoyed in many of the palatial homes of the city.

Introduction of Electricity to the Farms.

The one thing above all others which has brought about this wonderful change in living conditions is electricity, which was first introduced to the farmer through the modern automobile, which was equipped with a self-starter and electric lights, the power therefor being provided by an electric generator and a storage battery, the two principal elements of the up-to-date farm lighting plant. Many farmers today understand the general features of the construction and operation of an electric generator and storage battery, and many of them have become sufficiently familiar with such equipments to make it possible for them to make repairs and to operate them more or less scientifically.

Kind and Size of Plant Needed.

There is a demand today for a well made, neat appearing, not too highly automatic, yet conveniently operated electric light plant for the farm, consisting of a good gasoline engine, either belted or direct-connected to a generator producing from 750 to 1,500 watts at 32 volts, and connected to a good 160-ampere-hour storage battery in glass jars. Such a plant should provide sufficient current to operate a churn, cream separator, electric iron, washing machine, a shallow-well suction pump, capable of working against a pressure of 50 pounds, and should at the same time provide current for what might be called a 40-light installation.

While many farms are being wired for as high as 60 lights, the average number of lights used at one time under ordinary conditions is scarcely ever more than ten, yet in order to have a reserve it is recommended that nothing less than a 160-ampere-hour battery should be used, as any battery smaller than this requires charging too often. Since the cycles of a battery are approximately limited, it stands to reason that a larger battery will give much more and much longer service. A fully charged 160-ampere-hour storage battery of 32 volts may be said to contain about 5,000 watt-hours, and will operate approximately eight 20-watt Mazda lamps for four hours per night for seven or eight nights. According to the number of lamps used on the average farm, it will be seen that one charge of the battery will provide sufficient energy to supply the average farm home with light for one week, not considering that current may be used for other purposes.

Economical Operation.

If the plant is easily operated, it is advisable to run the engine and generator when any device is being operated which consumes more than 500 watts. In fact, it is the most economical manner of operation, as there is a certain loss in battery storage of energy. It will be found to be

just as convenient when operating an electric iron using 500 watts to run the engine and generator, provided the lady of the house can start same conveniently, as the excess current generated may be put into the battery and used later for lighting.

The writer has sold and installed some 50 farm lighting plants this past season. For the past few years I have sold and installed a large number of such plants in the Middle West, and in my opinion the one thing above all others that causes the farmers to be the least bit skeptical is the battery, as many of them base their judgment upon the performance of their automobile batteries, but there is no comparison between the service required from an automobile starting, ignition and lighting battery and a purely lighting battery which operates at all times under normal conditions and which receives more or less scientific care, as a general rule.

Must Sell Service, Not Merely the Plant.

Service is the thing to sell the farmer. He usually understands gasoline engines thoroughly, the generator is simple, but the care of the battery puzzles him. Provide your customer, therefore, with a plant that will show him at all times the condition of his battery, either by means of an ampere-hour meter or a simple, easily understood hydrometer, and show him the limits of specific gravity within which he must operate. Use care in giving him instructions as to the operation of his plant and call on him frequently, giving him advice as to the operation to secure for him the longest and best possible service. You will find at each call that he has a live prospect for you to call on in his neighborhood. The day has long since gone by when the farmer can be sold any old thing. He has become more or less posted, and surprises the fellow who thinks he can fool the farmer.

Square Deal Makes Farmer a Strong Booster.

Deal with the farmer on the principle that the wagging tongue of a satisfied customer is the best advertisement. Sell him right, let him know and understand all of the conditions under which he may purchase one of your plants. Lay all your cards on the table, deal square, do all you agree to do. Do him a good job of wiring at a reasonable price, and deliver him a plant that will do all or a little more than you claim for it, and he then becomes an agent in his community for you. He boasts at butchering times, at corn bees, thrashing time. He talks about you over the telephone, where his neighbors can all hear. He invites them to his home to spend the evening. He shows them the electric light plant and says things about you that would make his wife jealous of you. He can sell a plant quicker than you can, and, if you continue to render him service and give him advice occasionally as to the operation of his plant, he continues to boost, but, if, on the other hand, you deceive him in any way in the transactions, you will find him the most persistent and cheerful hard knocker you have ever met. The farmer believes there are times when wood should be sawed with a hammer, and he usually doesn't take time to find a padded one.

Service is the final analysis of all human endeavor, and the farmer is not unlike other men. He is willing to pay for this service in the initial cost, as well as to boost for your proposition to his neighbors, but he is a most unwilling servant if he feels that you have not dealt squarely with him in every particular. He doesn't care whether your plant is made of steel, brass or copper, whether it has three fly wheels or none; he does not, as a matter of fact, take this into consideration. If your plant will furnish him electric light and small power service conveniently, economically, and for a reasonable length of time, and he feels that he has you at his back in case something happens which he does not quite understand, he is satisfied.

Splendid Business Opportunity for the Electrical Contractor.

There is a greater opportunity just at this time to do electric wiring, sell fixtures, lamps and utility devices at a reasonable profit in the country than in many cities where there is so much keen and intelligent competition. The farmer is looking for some one who will sell him a good plant, wire his premises, furnish the fixtures and lamps and turn the whole installation over to him ready for service.

On 90 per cent of the plants which are being sold in the Middle West today there is absolutely no competition on the wiring and fixtures, and the jobs are usually much larger in the country homes than in city residences, as the farmer almost invariably has all of his outbuildings wired and some additional outlets for small motors put in. He is willing to board your men, haul the plant and material from the nearest railroad station and render other service, such as he is accustomed to render for other mechanics who come to his farm.

There is a most wonderful opportunity at this time for men who understand the construction, operation and installation of small electric light plants. The day is not far distant when the acetylene, gasoline gas, and the old coal oil lamps and lanterns will be as scarce as the farm is today which does not boast of its automobile. There are many counties in Iowa and Illinois in which there have been sold, as many as 50 farm lighting plants during the past summer and this fall, and the writer considers the agency for some good, reliable electric light plant to be as valuable to an electrical contractor as a Ford agency has proven to be to the automobile man, provided he will equip himself to handle the business properly and will think and work.

Prompt Action Necessary.

This might be considered as a cry of warning to the trade. Men who are not electricians, many of whom are not sufficiently posted to sell and install plants intelligently are nevertheless selling many plants, and if the electrical contractor does not get his ear to the ground and hear the rumblings of country electrical business and establish himself in his county or counties, he will find that he has overlooked an important opportunity to make money and build up a permanent and profitable business.

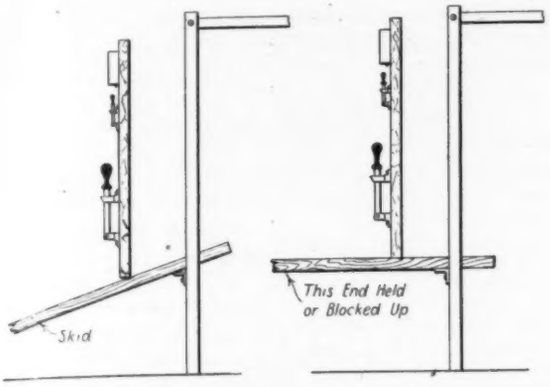
The writer has had a great deal of experience in farm lighting during the last 10 years and has gathered some valuable data and information on the subject, some of which may be published in subsequent articles, or, if any particular information is desired, he will be pleased to answer such inquiries as he may receive from readers of this journal.

Efficiency in Erecting Switchboards.

In erecting switchboards there are several methods at our disposal, and in the interest of the responsible party the method involving the least work and time will naturally be employed. The method of "blocking up," which was advocated in an article on this subject in the issue of November 18, 1916, has been laid aside by almost every progressive electrician in charge, as the time lost, combined with the risk involved, makes the above method most unsatisfactory. The simplest way is always the best, avoiding all complications.

The switchboard standard or mounting frame being in place ready to receive the board, two skids of the required size to hold the weight of the board safely are placed one on each side of the standard, one end resting on the angle-iron rest of the standard, the other end on the floor, as shown in Fig. 1. The board is now "walked" up by advancing alternate sides to a little beyond the middle and the ends of the skids resting on the floor are then raised to the level of the angle-iron rest (as in Fig. 2) and either held there or blocked (usually held, as blocking requires too much time). The board is now "walked" into the standard. One side is raised, the skid with-

drawn and replaced by a small board half an inch thick. The same operation is repeated for the other side. The half-inch pieces are now taken out, one by one, by raising first one side and then the other. When dry and not too short skids are used there is no danger of the board slipping and the board will not chip if handled with reasonable care.



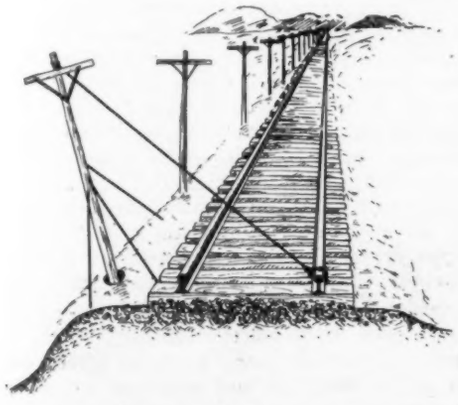
Figs. 1 and 2—Two Steps in Mounting a Heavy Switchboard Panel Into Place.

The above is a simple and quick method of erecting a board and has been found to be far superior to any other. The risk and cost are reduced to a minimum. This method is more commonly used at the present time than any other by all practical men. George R. Strombom.

Easy Pole Construction Along Railroad Embankments.

Very often during line construction, trouble is found in raising poles alongside railroad tracks where the grade is higher than the surrounding country and the pole is required to be set on the embankment side, especially at a curve. To facilitate the raising of the pole and to relieve the strain on the men in piking at an awkward position on a slope and below the pole, we have used the following method.

Hook a chain around the further rail, or better yet around the end of a cross tie under the rail, with the eye free. Take a line and give it a turn around the top of the pole, keeping both ends of the line even and passing the ends through the eye of the chain with two turns. Raise the pole with "dead man" as far as necessary for

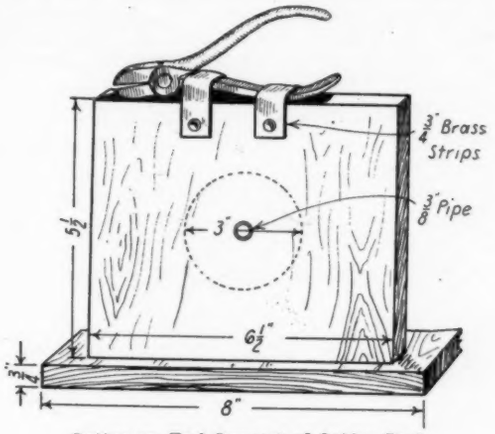


Erecting Poles on the Embankment Side of a Railroad.

piking and then have all the men pike from the high side against the pull of the line. The line can then be taken up or let out as necessary and the pole easily held in proper position until hole is filled and tamped. J. H. Davis.

Cutter for Solder Reel.

The diagram herewith illustrates a solder reel with convenient cutter which has been in use for some time in our shop. Trouble was formerly experienced in cutting the strip solder from the reel, owing to the men not always having a pair of pliers handy. The result of this



Cutter on End Support of Solder Reel.

was a waste of time and also usually of solder. This led me to attach an old pair of pliers to the top of the reel holder by means of two brass strips fastened on by wood screws. The reel holder is made of three pieces of lumber with a length of three-eighths-inch pipe running through the center of the reel as an axle or shaft for it to turn on. This scheme has worked very well. G. Olson.

Among the Contractors.

The Miller-Hill Electric Company, Portland, Ore., has been awarded the electrical contract on a new $90,000 high school building, to be erected at Roseburg, Ore.

The contract for installing the flood lights with which the city hall in Norfolk, Va., is to be illuminated has been awarded to Meeks-Reed Electric Company, of Norfolk.

NePage, McKenny & Company, Armour Building, Seattle, Wash., have the contract for installing the electric wiring in seven vessels of the Willamette Iron & Steel Works, Portland, Ore., at about $90,000.

Russell & Company, who recently moved their offices from 444 Columbus Avenue to 56 West Forty-fifth Street, New York City, have a contract for the installation of new feeders and panelboards in the building for the New York Dressed Beef Company, at Eleventh Avenue and Thirty-ninth Street, New York City. This company is also installing the electrical equipment in the building at 211 West Nineteenth Street, New York City, for the National Cash Register Company.

Eardley Brothers Company, Salt Lake City, Utah, is installing complete conduit systems with Crouse-Hinds headlights and also complete power systems for machinery in the Oregon Short Line Railway's roundhouses at Pocatello and Nampa, Idaho; and Montpelier and Kemmerer, Wyo. The same company is installing conduit systems in three schools in the Salt Lake school district, one school for the city of Garfield, the Utah State National Bank, the Second Church of Christ Scientist, the L. D. S. Administration Building, and has completed the work on the illumination system for the state capitol grounds, which includes 103 lighting standards of the "Day-Way" pattern, manufactured by the Luminous Unit Company, of St. Louis, Mo.

DOLLAR WIRING KINKS

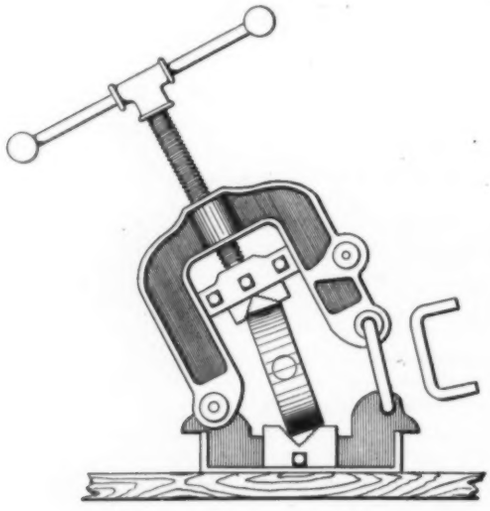
Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Making Very Short Conduit Bends.

In concealed conduit work an extremely short bend is sometimes needed, for instance, in a thin reinforced concrete slab when it becomes necessary to enter the bottom of a box. I use a coupling to protect the thread on the piece of conduit on which I make the shortest bend possible without kinking the pipe. Then I reverse the solid die in the stock and run over the thread, continuing it toward the bend until it almost begins to cut through the pipe on the inner side of the bend. An all-thread nipple can then be cut off, leaving just enough thread for the locknut, box and bushing. I have made smooth bends measuring 2.75 inches from the end of the pipe to back of the bend in this manner. A. L. Henge.

Extension for Pipe Vise.

Frequently it is necessary to ream out holes in outlet boxes that are too large to be clamped in an ordinary pipe vise. I have found by making a C-shaped iron piece



Extension Piece for Pipe Vise.

out of about three-eighths-inch reinforcing rod and inserting it in the vise as shown by the accompanying sketch, that it would then accommodate all outlet boxes in general construction use. R. A. Knoerr.

Installing Wall Boxes After Roughing-in Is Finished.

On many jobs where flush switches or receptacles are to be placed in the center of panel work, in baseboards, or on casing, the exact locating and setting of wall boxes when roughing-in takes a great deal of time and the boxes are not always in line with the finished work.

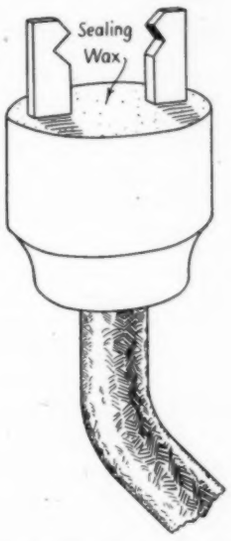
I have found it better to run the wires to the location shown on the plans, leave plenty of wire after ending the run, twist the ends together loosely, mark the spacing of the studding on the wiring plans, and then have the walls covered or plastered as though wires were not there.

Before the final coat of paint or varnish is applied, set the boxes, the location of wires and studding being known from the wiring plans. A piece of cardboard or sheet metal cut to exact size of single, two or three-gang wall boxes, is placed where the fitting is to set, the edges marked and an opening cut. The wires can now be fished out and loomed into the wall box which in turn is secured to the laths or woodwork and the switch or receptacle inserted. Plates should not be installed until all work is completed by the painters. Reasonable care should be taken not to cut or strip wires when making the opening.

Robert Oster.

Sealing Caps for Attachment Plugs.

In putting Hubbell attachment-plug caps on extensions using reinforced cord, I have found it convenient (after connecting the wires to the terminals in the cap) to pour

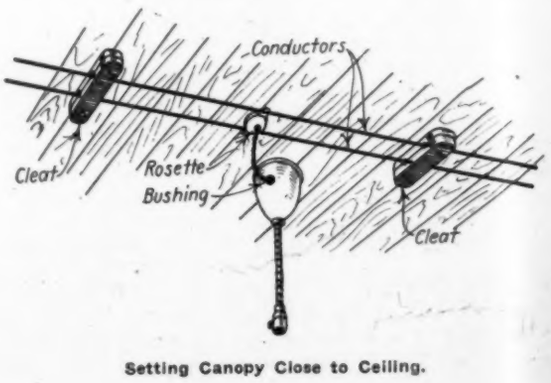


Sealing the Cap of Attachment Plug.

hot sealing wax around the connections as shown in the sketch. This keeps water out of the cord, acts as a strain relief for the binding screws and prevents the cord from being pulled loose from the cap. E. G. Quarnstrom.

Setting Fixture Canopy Close to Ceiling in Open-Wiring Installation.

In hanging fixtures in installations using open wiring and cleats, I find that it is a common custom to run the wires over the edge of the canopy, thus leaving the latter a short distance from the ceiling. I believe it is much better to punch a hole in the canopy to allow the snug fit of a rubber socket bushing. The fixture cord is passed through this bushing instead of over the edge of the canopy. This makes it possible to fasten the canopy tight against ceiling, making a neater job. P. Plourd.



Setting Canopy Close to Ceiling.

National Association of Electrical Inspectors

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"LET THE CODE DECIDE."

Secretary's Message.

The Secretary desires again to call the attention of members to the fact that if they have any changes in the Code to suggest and which they wish to have indorsed by the Association, they must have them written out exactly as they wish them to appear and in my hands not later than the beginning of Christmas week at the latest, as I must send them as far as Vancouver, get them back and in Mr. Sweetland's hands not later than January 15.

Notes from the Sections.

The Western New England Section will meet in Springfield, Mass., on January 10, when it is expected that Mr. Canada, of the Bureau of Standards, will present a paper. It is the present intention of the Eastern Massachusetts Section to visit Springfield at that time.

The Eastern Massachusetts Section held a very interesting meeting at the office of the Commissioner of Wires, Boston, on Friday, November 10, with a very full attendance, the time being principally given over to a discussion of local problems arising in the several jurisdictions represented. Melvin Mahoney, of the Inspection Department of Portland, Me., was elected a member. It was voted that the next meeting should be on December 8, probably at Youngs Hotel, Boston, and that proposed changes in the Code should be the formal order of the day.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

The Secretary of the California Section writes that at a recent meeting they were given a talk by C. R. Dawes, electrical inspector of Sidney, New South Wales, who gave an extremely interesting comparison of electrical methods in Australia with what he had observed here. He stated incidentally that the use of Stannos and other concentric wiring systems was markedly on the decline. He felt that our requirements as to the running of rubber-covered wire in conduit were considerably more severe than those insisted on in Australia.

On Monday evening, November 6, 1916, the members of the New York Section met in the assembly room, Municipal Building, to hear Thomas H. Day, of the New England Fire Insurance Exchange, speak on "Concentric Wiring." Although it was the night previous to election, the attendance was good. Mr. Day has many friends among the electrical inspectors of this territory and they had been looking forward to his visit apart entirely from the subject of his talk, though, of course, they were interested in the paper also.

Statements have been advanced to show that the adoption of concentric wiring would cause an increase in the use of electricity due to the low cost of installing; also that it was being used extensively in Great Britain, where it was giving satisfaction. Having this in mind, Mr. Day, as a result of much effort, secured considerable data, not alone from those interested in its use here, but also from electrical authorities on the other side, which he presented in an impartial manner in the course of his talk. He had on hand a complete set of apparatus and fittings, both American and British, which were explained in detail and passed around for examination. A service cutout of the latter type was of particular interest, being equipped with a plate which permitted a fuse of only one certain size to be used, and should one of greater capacity be required, it would be necessary to remove this plate with a special key wrench, substituting the one intended for size fuse needed. Different colors were the means employed to identify the capacity of the fuse after being installed, this probably being intended as a slight concession to the inspector.

Following Mr. Day's talk there was a lively discussion which brought out the following points. The adoption of concentric wiring would be a considerable step backwards from the present standard of wiring; the multiplicity of small fittings required to secure continuity of the outer casing, which is of vital importance, would make it difficult to obtain good work in the hands of indifferent mechanics; the system did not adapt itself to neat construction, as it may be employed only for exposed work.

Joseph Honey, chief inspector of the Borough of Manhattan, reported two experimental installations of this system in New York City. Then Hubert S. Wynkoop, electrical engineer, City Department, exhibited samples of the latest types of metal molding and fittings, some of which had not, as yet, been approved by the department; he wanted it understood, however, that it was only in the nature of a "side show" to Mr. Day's assortment.

G. E. Bruen, superintendent of the Suburban Fire Insurance Exchange, who presided, announced that the biennial election of officers would be held next January.

Cabinet for Mixed System.

Question 336. Is a wooden cabinet permitted on an installation having feed to panel in conduit and all feeds to individual centers in knob and tube? In other words, what is the exact meaning of the word "system" or would one run of conduit in a mixed job control the layout?

Answer 1 (P)*. Where different kinds of construction are used in the same job the *prevalent* kind usually determines the classification of the entire equipment. The inspection department will have to take into account a number of local factors before making its decision. No hard and fast rule can be drawn in a matter of this sort, which is comparable to demanding a decision as to whether a dwelling should be classed as a frame building or a brick building where some of the walls are of brick and others of wood. That is quite ludicrous.

Answer 2 (P)*. I do not see a rule exactly covering the question asked, but it would seem when the other Code requirements are taken into account as though an iron cabinet would probably be required.

Answer 3 (B)*. Rule 19*b* means just what it says, and where metal-conduit, armored-cable, or metal-molding systems are used, if they run into a cutout box, that cutout box must be of approved metal construction. If you have but one circuit, this circuit could be terminated just outside the box with proper construction and then enter the wooden cabinet, in such manner as is approved for use with wooden cabinets.

Answer 4 (S)*. In this case I think that the layout is controlled by the run of conduit and a metal cabinet should be used. If the installation is an old one with wooden cabinets I would allow conduit connected to same provided that conduit is equipped with an approved fitting for exposed work.

Answer 5 (E). Under the conditions named in the question we would permit of a wooden cabinet. One conduit used for the mains into a cabinet in an installation consisting of a number of circuits, is not a system according to our understanding of the English language.

Answer 6 (K)*. Yes, it is. A mixed system is not a conduit system. However, if the majority of circuits are in conduit a metal cabinet should be used.

Answer 7 (V). Where the mains are in conduit and the remainder are knob and tube, it would be considered a knob-and-tube system in this jurisdiction.

Answer 8 (Y and X). All switch-box construction to be approved must be at least No. 16 U. S. gauge metal.

Answer 9 (N)*. Of course it is permitted. The word "system" is defined in the Digest of Supreme Court Decisions of this Commonwealth as "A combination or assemblage of individual parts or things so interconnected as to make one complex whole." When the Code in Rule 19*b* says *conduit system* it must be taken to mean precisely what it says. One run of conduit does not make a conduit *system*, any more than one swallow makes a summer. I allow the conduit to run right through the wall of the cabinet and end in a close set condulet-type fitting. An inspection department may state in its rules that a six-foot run of conduit and all the rest of other types of work should be a conduit system under this rule, but if any specific case involves money enough to make a contest worth while, it will be laughed out of court.

Answer 10 (M). The question of what constitutes a metal-conduit system, insofar as Rule 19*b* refers to a mixed knob-and-tube and conduit installation, we have interpreted to mean where any run of conduit enters a cabinet, the cabinet must be made of metal.

Answer 10 (O). In the absence of any specific definition in the Code of a "conduit system" any run of conduit, no matter how short, must be considered a system and must be complete in itself, that is, must be continuous between its terminal fittings, such as outlet boxes, Condulet-type fittings or approved cabinets. A wooden cabinet may not be used as a terminal fitting for a conduit, but in case of a few branch runs of conduit from a wooden cabinet, the conduit may be terminated properly in an outlet box or other suitable terminal fitting which provides separate insulating bushings for each wire, the fitting being located either within the box or just outside the box. This does not apply, however, except to branch runs, since Rule 28*b*, second paragraph, requires service conduits on main runs to end in a main cutout cabinet or gutter surrounding the panelboard.

Size of Motor Feeds.

Question 337. It is desired to install two 20-horsepower, one 15-horsepower and one 7.5-horsepower, three-phase, 220-volt motors. Omitting considerations of volts lost, what size of conductor should be used for main feeds and what for the individual motor sub-mains?

Answer 1 (P)*. In order that this question may be properly answered kindly submit information as to the starting and running current per phase of each motor and the conditions under which each motor operates. If this information is available the answer may be found in the Code in Rules 8*b*, paragraphs 5 and 6, and 8*c*, paragraph 5.

Answer 2 (H)*. The mains for the installation noted should be No. 0 RC or No. 2 SB. For the 20 and 15-horsepower motors the sub-mains should be No. 6 RC or No. 8 SB, and for the 7.5-horsepower motor No. 8 RC or No. 10 SB.

Answer 3 (B)*. The capacity of mains may be based on the total capacity required by the combined horsepower of the motors, the branch or sub-mains being each of the rated capacity designed to carry a current at least 25 per cent greater than that for which the motor is rated.

Answer 4 (G). This is a question which should never be definitely answered by an inspector. From the information given the answer should be about as follows. The mains according to the Code may not be smaller than the size which will safely carry a current equal to the sum of all the full-load running currents as per name-plate data, and should preferably be large enough to carry this current, plus the excess due to starting current of largest motor connected. Each branch circuit should be of a size properly protected by the fuses found necessary to carry the starting current under actual working conditions.

Answer 5 (E). Assuming the full-load currents of the motors are 50.5, 37.5 and 19.5 amperes, the sub-main sizes would be No. 2, No. 4 and No. 8, all B&S gauge. The gauge of the mains for all four motors should be No. 0000. It is understood that the insulation on the conductors is rubber and that for the sub-mains Table B is used in fusing, while Table A is used in the mains.

Answer 6 (K)*. Section 5, Rule 8*b*, covers the size of wire to be used for the individual motors. Where a num-

ber of motors are used a load-factor should be considered and the mains figured accordingly. If the mains are properly fused there is no hazard.

Answer 7 (V). Twenty horsepower, No. 2 wire; 15 horsepower, No. 4; 7.5 horsepower, No. 8; mains, No. 0000.

Answer 8 (Y and X). Twenty-horsepower feed, No. 2; 15-horsepower feed, No. 4; 7.5-horsepower feed, No. 8; mains, 250,000 circular mils.

Answer 9 (M). The mains should be 211,600 circular mils, or No. 0000 and the three sizes of motors require No. 2, No. 4 and No. 8, respectively.

Answer 10 (N)*. The answer cannot be given definitely for there is not sufficient information given. We must have at least name-plate data and preferably information as to the type of load, drive, etc. A motor may start idle and pick up through a clutch, as one type of General Electric motor, or it may start belted to a machine which starts with it. With this at hand, the individual motors would be wired as per Rules 8*b*, paragraphs 5 and 6, and 8*c*, paragraph 5. The mains should be wired and fused allowing a load-factor which it is the consulting engineer's province to decide on, and not the inspector's.

Answer 11 (S)*. The Code does not answer this question except in part. Rule 23*e* will give us some light on the subject and for further information we must go outside the Code. In order to calculate the size of mains to supply more than one motor, take the sum of the full-load currents of all, except the largest motor supplied, plus the current required to start the largest motor supplied from, such mains, and from this total select a wire size from Table A or B, of Rule 18, according to insulation.

The full-load current for three of the motors will be as follows: 19.5+37.5+50.5=107.5 amperes. To this must be added 110 amperes, the starting current of the other 20-horsepower motor, as required by Rule 23*e*, making a total of 217.5 amperes. The sub-mains for each motor should be as follows: 7.5-horsepower, No. 8; 15-horsepower, No. 4; and for each 20-horsepower, No. 2. The mains should be No. 0000 if rubber insulation is used, or No. 00 if other insulations are used.

CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Safeguarding the Use of Electricity in the Home.

To the Editor:

The recent electrocution of a woman in Chicago, due to her inadvertently touching simultaneously the water pipe system and the electric light fixture raises several questions with which every layman as well as those interested in the electrical industry are concerned. Not only does this matter affect the welfare of the industry as a whole, but likewise perhaps the lives of our families. My object in raising this matter is to start discussion of existing precautionary measures, and help toward removing the stigma which now rests upon portable electrical appliances in the opinion of many, while possibly helping to prevent the recurrence of a similar fatality.

In the modern building, and in the small flat especially, space is cramped in the extreme, and it is often necessary to install the ceiling light fixture in such a position that if turned on by chain the person turning it on can hardly help but touch the bath. The same remarks apply to the light above the kitchen sink. The possible danger from making contact with a live electrical fixture and the water pipe system has long been recognized by technical and civic bodies, and the compulsory use of insulated fixtures in damp places or when in close proximity to water pipes, baths, radiators, etc., is now almost universal.

In the writer's opinion using insulated fixtures, or chains, does not entirely eliminate the danger of shock and possible electrocution, but only masks the lurking danger. If an insulated fitting becomes charged the fact is not discovered until a shock is suffered, possibly with fatal results. On the other hand, if all fixtures in damp places, bathrooms, etc., are so located that contact might be made between them and the water pipe system they should be rigidly earthed to the water pipe system, or to that side of the secondary which is grounded. Should the fixture then become charged the fuses would blow because a short-circuit would then occur. That something was amiss would then be immediately indicated, it would be investigated and remedied before life became endangered. In the majority of cases fatalities do not result from shocks received as above, because the person receiving it possesses a normal heart, because the enamel on the bath or sink is in good condition and thus acts as an insulating film and because the path of current flow is not always over a danger zone. Unfortunately one's heart may be defective, and the insulating enamel on the bath may not exist and another electrocution has happened to bring unhappiness into a home and to create a disciple against the universal use of electricity in the home.

Apart from the pros and cons of insulated versus grounded fittings in bathrooms and similar places is it not highly desirable to look with disfavor upon the use of ceiling sockets and switches in those locations where the socket hangs close over the bath or its equivalent? Could not wall switches be installed in such places as standard practice? The risk from accident would be greatly reduced, if not entirely so, and the cost of interior wiring affected but little. I believe all who have the welfare of their families at heart, and realize the hidden danger of the ceiling chain socket in bathrooms concur with the above. Grounding one side of all secondaries below a definite voltage is now compulsory almost everywhere. While this practice prevents high voltage entering the circuits in houses from primaries fallen on low-voltage conductors outside, or when the primary of a transformer breaks down to the secondary, by blowing the service fuse, this same grounding only tends to make the shock suffered between the live and the grounded or the charged fixture and the water pipe the more severe. Current is, of course, the criterion as to whether a shock is dangerous or not for

a given path of travel—ignoring secondary effects, such as falls—hence solidly grounding one side of the secondary increases the life hazard. It would seem, therefore, that for the protection of the public all fixtures should be grounded instead of insulated.

With the advent of the many electrical appurtenances now on the market for use in the home and on the body, and lacking proper wiring facilities, etc., in some of the older houses, the ceiling socket is often used and abused in a way far different to that for which it was designed. The result is a defective and faulty socket. In many cases this means a dangerous socket—depending upon circumstances beyond the control of the householder. The remedy is to ground the socket.

The question of stationary fixtures is comparatively simple compared to that of reducing if not entirely eliminating the risk from portable appliances, such as radiators, hair curlers and driers, vibrators, etc. Many of these appurtenances are used in the bathroom, and on the body when it is least able to withstand electrical shock, because its resistance is low under the influence of heat, steam and water, and the heart is weakened. Conditions are almost ideal for fatal results with a minimum of current, and the danger therefore is a very real one. The use of properly installed fittings and receptacles is a move toward this end, but many homes have no such fittings.

The public service companies are vigorously pushing, the more vigorously the more wide awake the company, the sale of current-consuming devices of all kinds. Large sums are being spent annually to educate the public as to the convenience, reliability, economy and safety of electricity in its multitudinous applications. The purpose of these publicity campaigns is to make the public realize that electricity is the labor-saving, flexible, economical friend of the people, and thereby promote sales of current-consuming devices, increase the use of energy, improve the load-factor, and bring in greater returns.

Many of the appliances now on the market are far from being satisfactory as regards safety. The mechanical design of leads and elements leaves much to be desired. Some of these articles withstand a test voltage of 1,000 volts today, although marketed for 110 volts, but will fail in daily use in a very short time, because of careless handling and ignorance of the user. Greater effort is needed to make appliances foolproof and less susceptible to deterioration when in use. The cords are one source of danger in a large majority of appliances, and are doubtless responsible for a number of deaths. More care is also needed to prevent live elements from making contact with the frame of the appliance.

The cost of appliances, as a whole, is on the decrease to place them within reach of all. The standard of workmanship of many is also on the decrease, and as the cost comes down and sales increase the number of fatal shocks may be expected to increase likewise.

Familiarity breeds contempt, and this applies to the use of electricity as to other things. The availability of cheap electrical appliances and inexpensively wired houses places electricity in the hands of the poorer and more ignorant classes, means that more frequent electrocutions are to be expected in the future. A faulty fixture, a weak heart and a good ground—and another fatality is chargeable to electricity in the home, to act as a deterrent for many.

No one initiated would risk the possible danger of touching the water pipe and the electric light fixture together, although the chance of serious results is somewhat remote. Yet the same thing is being done every day by persons who do not know. While preaching safety of their appliances the central-station company's salesman does not warn his customer not to touch the water pipe and the fitting together. No, that might stop a sale, or create a doubt and hurt the industry. To use a vibrator or any electrical appliance on the body whilst in the bath, is obviously a foolhardy thing to do, yet the salesmen do not mention the possible danger of doing it. Surely the onus of imparting this information, legally as well as morally, rests with those disposing of the appliances.

If stationary fixtures should be grounded, it is still more important to ground the frames of all portable appliances. Let them be rigidly connected to the grounded side of the secondary. This is a simple matter whether concentric wiring is used or not, by the use of polarity plugs. Had this been done the woman electrocuted about three weeks ago would doubtless be alive today. Also the man who sat in the bath about a year ago and used a vibrator over his heart might be alive.

The use of electricity in the home is not without danger, and simple precautions should be practiced. Those that do not know—and how should they—should be told. It is to their interest to tell them, also to the interests of the industry as a whole. The necessity of imparting this information is more important now than ever, because the number of homes and appliances in any one home are increasing fast More knowledge is needed by the layman. Greater safety methods are needed for the interior wiring and for the appliances. If these are not furnished as a safeguard against accidents they will have to come from necessity. It is better to have them come now, for the sake of the public and the industry.

Chicago, Ill. F. S. Fletcher.

Uniformity in Catalogs.

To the Editor:

Will you kindly make a plea through your publication for more uniformity in manufacturers' and jobbers' catalogs, leaflets and discount sheets? We receive many discount sheets from which even the name of the jobber or manufacturer is omitted. It seems like a waste of effort to get out literature of this kind and it is certainly not in accord with the modern idea of system and efficiency. How are the smaller concerns expected to keep their papers in an orderly manner when they receive these in the condition outlined above and have such a poor example set for them by the larger concerns which should take the lead in providing convenient sizes, properly marked, in all their literature? It is no wonder so much of this finds its way into the waste basket; this is the only place which many of these documents suggest by their size and appearance.

Rochester, Minn. Ed. M. Raetz.

New York Electrical Men Discuss Grounding of Secondary Neutrals.

The meter and distribution committees of the Empire State Gas and Electric Association held a joint meeting with the State Board of Fire Underwriters, on November 9 and 10. At the first session the general operation of an electric meter department was discussed, the most important point to be brought out being the desirability of testing transformers on receipt from manufacturers. At the second session the grounding of the neutral on alternating-current secondary distribution systems was the topic of discussion, which showed that there was considerable opposition to this practice. Representatives of the underwriters in their discussion overcame much of the objection to grounding.

On Friday those in attendance at the meeting were guests of the Rochester Railway & Light Company and were shown the new development work at Station No. 5 on the Genesee River.

BOOK REVIEWS

"The Book of Electricity." By A. Frederick Collins. New York: D. Appleton and Company. Cloth, 185 pages (5 x 7½ inches), 145 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $1.00.

This is essentially a book for the boy with enough inquisitiveness to want to cultivate at first hand the acquaintance of nature as expressed in electrical phenomena. It deals primarily with the "how" of constructing simple apparatus for this purpose, the "wherefore" being largely left for future investigation. On the title page it is stated that the book is written to conform to the tests of the boy scouts and care has been taken to cover the requirements for a merit badge in this subject. One of the chapters is entitled "How To Do Electric Wiring," and it seems unfortunate that the author should encourage amateurs to engage in practical wiring jobs with no more preparation than reading this book, even though the reader is warned of the advisability of complying with the National Electrical Code and using approved materials. No hint is given that in some jurisdictions the requirements are more stringent than the Code rules. Experiments are outlined in the rudiments, in telegraph and telephone work, in measurements, in using a spark coil, in constructing simple forms of dynamo and motor, in connecting up lamps, etc. The reader should have no difficulty in carrying them out.

"Coal and Coke." By Frederick H. Wagner. New York: McGraw-Hill Book Company, Incorporated. Cloth, 431 pages (6x9 inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $4.00.

The author has collected in this volume data and information relative to coal and the manufacture of gas and coke which have been presented in a number of papers from the Bureau of Mines, the Engineering Experiment Station of the University of Illinois and various technical journals on these subjects and has placed them in a very available form for reference. To this he has added data from his own experience.

The book is divided into two parts, one on coal, the other on coke. In the latter the author has dicussed gas making as well. In part one the author describes the manner in which coals are classified and the way in which they were formed. Tables showing the composition of various forms of coal from different localities are given. The subjects of oxidation and spontaneous combustion are treated and various theories given, quoting extensively from the work of Parr and Kressmann. The coking and gas coals are considered in one chapter and data are given from analysis and distillation of coal showing what conditions are proper for manufacturing gas.

In the chapter on coal analysis the author describes many methods in use by the United States Bureau of Mines, giving their limitations, but here and in the chapter on gas analysis there are certain instructions omitted, certain used terms undefined and certain sketches of apparatus omitted which would be very helpful to the novice. These omissions are not important to the chemist or experienced engineer and it is only for the man who uses the book to give him complete instructions that these should be included. The first part ends with a discussion of the preparation and storage of coal.

Under the subject of coke the author discusses carbonization in retort benches, the heating of retort settings, flue gases, thermal relations, carbonization in ovens, chamber ovens, low-temperature carbonization, waste-heat power production and finally coke, taking up the peculiarities of manufacture and preparation. In this section the author discusses the peculiarities of various types of retorts, by-product ovens, chamber ovens and bee-hive ovens, including as well reports on the cost of installation, operation, quality and quantity of gas and various economic data. The materials used in the construction of retorts and ovens and the various labor-saving devices are illustrated and described. The chapter on combustion and the heating of settings includes the use of producers and other apparatus for heating the retorts, the heating of ovens being considered in a later chapter. The chapter on ovens makes clear the value of the by-product oven in the manufacture of coke.

The book is a good reference book and one containing many valuable data. It will be of service to those interested in matters relating to coal and coke.

ARTHUR M. GREENE, JR.

"Electric Heating." By E. A. Wilcox. San Francisco: Technical Publishing Company. Cloth, 286 pages (5x8¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

This very valuable volume on the subject of electric heating has been prepared from the viewpoint of the central-station man. The author was until recently heating specialist for the Great Western Power Company and is thoroughly familiar with his subject. The different forms of heating apparatus are described in a popular way and illustrated. The advantages of the electrical method are pointed out and many data given which will prove useful both to the central-station man and to the user of appliances. The proper installation of heating apparatus is also discussed. The book aims to set forth in a practical way the many uses to which electric heat may be applied. Relative operating costs for electric and fuel-heated apparatus are given.

Very detailed attention is given to electric cooking, this subject occupying three of the 27 chapters. Other subjects dealt with are water heating, the heating of buildings, incubating and welding. Two chapters are devoted to electric furnaces, but the discussion of this subject is not as complete as might be wished. This, however, is not a serious drawback to the book, since literature upon the subject of electric furnaces is sufficiently abundant and a full discussion of that subject would, perhaps, make too bulky a volume. Industrial heating is fully discussed and one chapter is given to miscellaneous applications of electric heating. The final chapter is given to a discussion of rates for heating service which will be of interest especially to the central-station man. An appendix gives a very valuable collection of tables and includes a list of manufacturers of heating devices, electrical and thermal constants, specific gravities, expansion co-efficients, etc. The volume should be in the hands of every central-station solicitor and will also be found useful to the electrical contractor and to the user of electric heating devices.

"Purchasing." By C. S. Rindfoos, New York. McGraw-Hill Book Company, Incorporated. Cloth, 165 pages (6x9 inches). Supplied by Electrical Review Publishing Company, Inc. for $2.00.

In treating such a broad subject as purchasing, the author, president of a large purchasing corporation, has succeeded in covering the subject in a general way in comparatively few pages without sacrificing much more than the endless number of examples and comments on the different phases of purchasing that could have been given. The method of attack is commendable. The most important factors of purchasing are made the subjects of the ten chapters, and in each the matter is subdivided under headings and treated in a direct and concise manner. Summaries of the chapters aid in the purpose of the book. In a chapter on purchasing forms, valuable suggestions are given for the preparation of them. While few references are made to the purchase of electrical materials, to buyers of such the book retains its value and general application.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

"Best" One-Man Sign Receptacle.

The Best Electric Company, Pittsburgh, Pa., is placing on the market a sign receptacle with which it is claimed one man alone can successfully wire or repair wood or metal signs.

Only one round hole is punched for installing, and the

New Sign Receptacle.

receptacle is inserted from the front of the sign. The receptacles are then lined up, wired and soldered, and the supporting screws driven in.

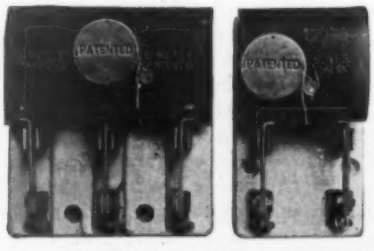
As shown in the illustration, one-half the diameter of each supporting screw fits into the receptacle groove, and the other half binds into the sign. As the holes punched in the sign are round, the receptacles can be turned as required to keep the wiring in alinement.

A broken wire or connection is repaired by loosening the supporting screws on three receptacles, thus slackening the wires sufficiently to allow the center receptacle to be drawn through the hole and repaired. This method makes it unnecessary to break into the sign.

The "Best one-man" receptacle, as it is called, is made of asbestos composition, which the manufacturers claim is proof against water, fire and oil, and also insures all receptacles being uniform in size. A detailed, illustrated description can be had by addressing the company at Pittsburgh.

Acme Meter Lock.

Central-station companies have long sought some simple means to protect their services against tampering before a meter has been connected and also to avoid entirely removing a meter after premises become vacant and until a new tenant or owner takes possession. A very simple meter lock that accomplishes both these things has been invented and patented by G. Wesley and, as already shown in a large number of installations, it saves considerable time and money to the central station using it.



Three-Wire and Two-Wire Meter Locks.

It consists of a simple strip of strong fiber that fits over the Edison fuse receptacles at the service switch. This strip has a hole matching with one of these receptacles. The fuse plugs are removed and the strip put in place, being locked in this position by a dummy plug that is inserted through the hole referred to and sealed through its rim. In this position the fiber guard completely covers the service terminals and their fuse receptacles, so that theft of current is impossible.

As shown in the accompanying illustrations, this device is made both for three-wire and two-wire circuits. The dummy plug cannot be removed without breaking the seal, nor can the fiber strip be sprung or bent out of protecting position, so that it is impossible to attach jumpers or current by-passes.

This device is inexpensive and easy to install. Its small size and weight permits the central-station representative easily to carry a day's supply of them in his pockets. The outfit is manufactured by the Acme Electric Meter Lock Company, 321 Minnesota Street, St. Paul, Minn.

Federal Electric Washing Machine.

The washing machine illustrated herewith is manufactured by the Federal Sign System (Electric), Chicago, Ill. In the manufacture of this machine, the makers have endeavored to take into consideration every point that would promote its efficiency, durability and pleasing appearance. In design, it is symmetrical; the color combination is pleasing and neat—being pure white enamel with a blue border; the quality of this enamel and the manner in which it is applied insures an absolutely clean appearance at all times.

In assembling the mechanism the makers have so arranged it that the least possible space is occupied and yet they have provided a good, rugged mechanism that will amply take care of whatever task is asked of it. This mechanism is mounted on a cast skeleton frame which insures permanent alinement, and guards absolutely against warping at any time. The gearing is clean-cut and extra large, so that it is fully capable of standing the hardest usage. In determining what drive should operate the Federal washer, it was decided to use a belt for the sake of safety.

The drum operates with an oscillating motion, throwing the clothes back and forth against its perforated sides and by this motion forcing the hot soapy water through the fabrics and driving out the dirt which this operation loosens. This promotes more than a mere movement of the water and as a consequence is said to produce absolute cleanliness in the quickest possible time and with least injury to the clothes.

The capacity of the machine is ample to take care of the equivalent of 12 sheets. The mechanism is driven by a one-fourth-horsepower Westinghouse motor, constructed especially for such service as washing-machine operation. The motor can be provided for either alternating current or direct current.

The machine is equipped with a high-speed wringer, which is operated by the same motor that drives the washer. This wringer is topped by a safety release device which, in case of accident, on an instant's notice can release all pressure on the wringer. This operation requires simply a quick blow of the hand.

The Federal Electric Washing Machine.

The control system is so placed that all levers, switches, and buttons are at the right-hand side of the machine, easy of access. A push-button switch controls the motor, while a hand lever just below the switch controls the oscillating cylinder, and a vertical lever above the push button controls the wringer. A notched quadrant retains the wringer lever in the position into which it is thrown. There are three positions for the wringer lever: One neutral, one forward and one reverse.

A glass gauge on the side of the machine insures proper water level. One of the most important features connected with an electric washing machine and the one which is practically responsible for a good, clean wash, or the failure of it, is the proper amount of water. The glass gauge on the Federal machine insures almost to a drop the proper amount of water.

All oiling holes are plainly indicated by red arrows, and are of easy access. Easy rolling castors permit moving the machine about readily. The machine is constructed entirely of metal, with the exception of the drum in which the clothes oscillate; there is, therefore, no chance of trouble with either wood splitting or warping or the machinery getting out of alinement. It washes thoroughly and easily everything consigned to it whether it be a heavy blanket or a fine piece of lace. All moving parts are absolutely inclosed so that, taking it all in all, one finds in the Federal a perfectly safe washer, simple of operation, and yet a machine of the highest efficiency.

Large Duplex Exciter Units for New Power Station of Buffalo General Electric Company.

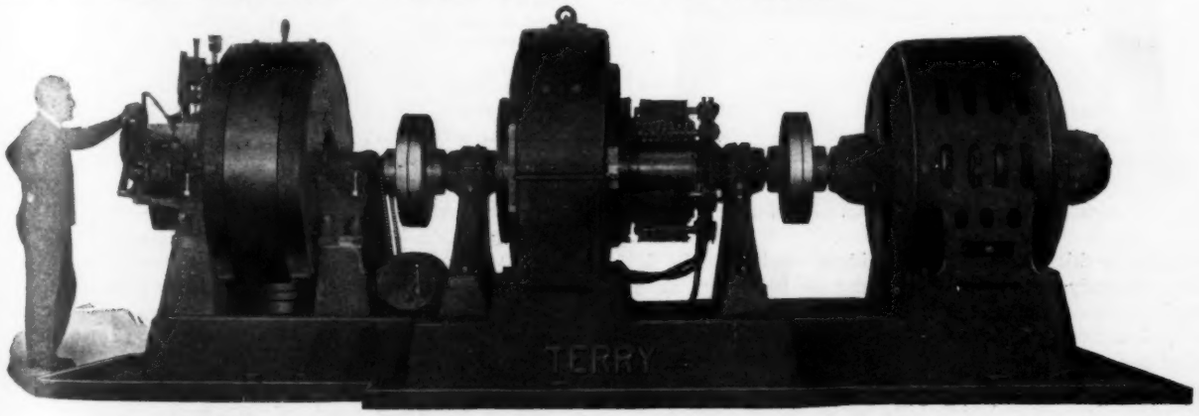
The three large exciter units which are now being installed in the new power plant of the Buffalo General Electric Company, Buffalo, N. Y., have a number of interesting features. Probably the most original point is that the plant is insured against loss of excitation by providing two independent sources of power for driving each exciter.

Each unit consists of a 300-kilowatt exciter, direct-connected to an induction motor at one end and a steam turbine at the other end. Through an ingenious arrangement the governing mechanism of the turbine is so adjusted that if the power for the induction motor should fail, the turbine would automatically pick up the load. In case of trouble on the main circuits, the exciters can be depended upon to take care of themselves without attention, and the operators can give all their attention to clearing up the trouble on the mains, while with ordinary motor-driven exciters the latter units shut down as soon as the voltage of the main circuit fails and it is necessary to start up an independent unit before voltage can be restored to the main circuits.

Another advantage of the duplex exciter is that it gives the exciter unit a higher all-day efficiency than either a motor-driven or a steam-driven exciter. This maximum efficiency is secured by driving the unit from the turbine end when the station is operating at full load and the turbine exhaust can be efficiently used in the heaters, and by shifting the drive to the motor end when the station load is light, and the main generators can easily carry the exciter load.

The large capacity of the units (300 kilowatts, normal) and the high pressure and temperature of the steam supplied to the turbine, (275 pounds, 275 degrees superheat) as well as the duplex-drive feature, make these units worthy of note. The turbines were manufactured and the units assembled by the Terry Steam Turbine Company, Hartford, Conn.

The clean-cut design of these units is well shown by the illustration below. A substantial and heavy base insures perfect alinement of the individual elements of the complete unit at all times.



Duplex Exciter Unit Driven Either by Steam Turbine at Left End or Induction Motor at Right End.

Automatic Arc Controller for Motion-Picture Projecting Lamps.

To obtain the best results in motion-picture projection, the projecting lamp must furnish a steady, white light. With an arc lamp this means that a certain definite length of arc with practically constant current is required. These conditions give not only the best light, but also the most economical energy consumption. Departures from these

The Auto-Arc Controller for Projecting Arcs.

conditions mean unsteady, bluish or yellow light together with excessive consumption of energy.

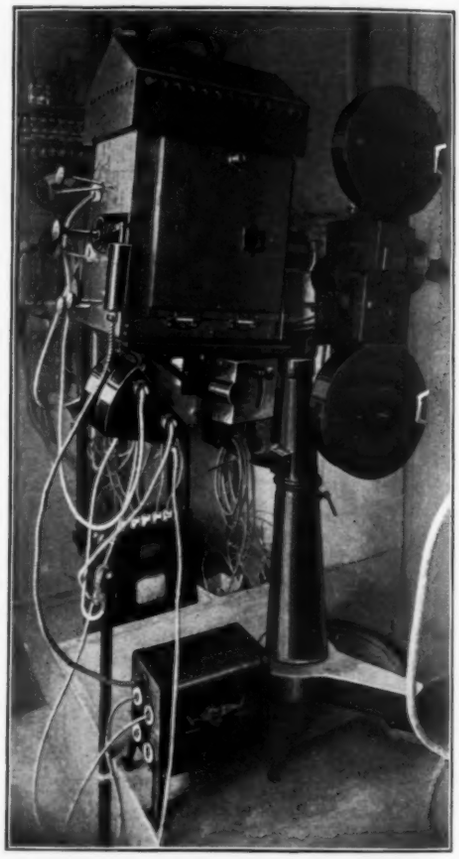
When the picture-machine operator also has to feed the arc lamp by hand, it is obvious that his manifold duties will make it impossible for him to give proper and constant

Auto-Arc Controller With Cover Removed.

attention to this detail, with the evident result that the light will frequently suffer from too long or too short an arc length, because the operator will almost invariably bring the carbons quite close together, or "freeze" them, as it is called and then allow them to burn to a little beyond what should be proper arc length. This results in unsatisfactory, flickering pictures and high bills for electrical energy.

To overcome these difficulties there has been placed on the market a simple, but dependable automatic feed device for projecting arcs. It is the invention of two experienced motion-picture operators, who realized what was required and had the ingenuity to device an economical and easily installed automatic controller. The outfit is appropriately called the Auto-Arc. Its simplicity and compactness can be seen from the accompanying illustrations. It consists of two parts—the controller proper, which is a neat iron case about 11 inches high, 11 inches long and 6.5 inches wide, and the electrode-feeding solenoid, which is readily applied to the back of the lamp housing. The general view of a projecting machine equipped with the Auto-Arc device shows how the main portion of the latter fits conveniently at the base of the machine without being in the way, also how the feeding solenoid is compactly mounted on the rear of the lamp house.

The main portion of the device is essentially a differential relay, having two windings on an iron core; one is a coil



Auto-Arc Applied to a Motion-Picture Projector. The Main Part of the Controller is at Base of Machine; the Automatic Feeding Mechanism is on Back of Lamp Housing.

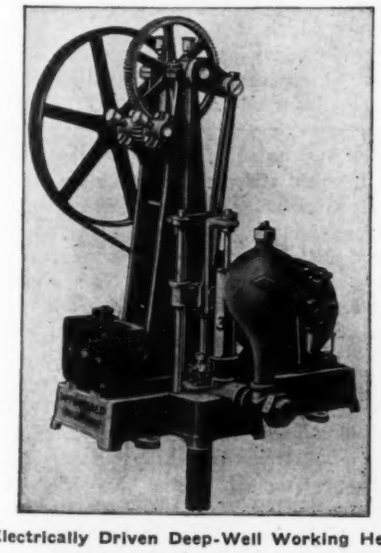
of many turns of small wire and forms the potential winding, the other has but few turns of large wire and is the current or series coil. As shown in the view of the device with cover removed, there is an armature at each end of this control relay. The one at the right acts as a circuit-breaker to prevent the Auto-Arc from operating until after the lamp is fed by hand and the arc struck in the usual manner; this eliminates the need for auxiliary switches, clutches, etc. The armature at the left end is normally held open by the long horizontal spring which can be seen along the side. An adjusting knob shown projecting at the right is provided for regulating the tension on this spring, which in turn governs the length of the arc; it has an adjusting range of 20 amperes, thus making it possible to use any desired arc current from about 30 to

50 amperes. As soon as the arc length exceeds by a slight amount the length desired and adjusted for, the tension of the spring overcomes the magnetic pull of the core on the armature, so that the latter makes a contact between platinum points and energizes the feeding solenoid on the lamp. This acts through a simple, but positive ratchet and lever mechanism to feed the carbons together a slight amount, which strengthens the pull of the coil so as to again attract the armature away from the contact. This action goes on at intervals, the device controlling the arc current within three-eighths of an ampere and the arc voltage within one-fourth volt. This means that the length of the arc is kept substantially constant, which is the desired aim. The fuses at the top of the controller coils are in the feeding-solenoid circuit; protecting it from current in excess of one ampere.

This outfit can be applied to any projecting lamp. From the machine table switch the wires are connected to the terminals on the controller marked "Line." From those marked "Lamp" wires are run to the lamp, including the rheostat in series in one wire. A flexible steel-armored cord connects from near the top of the controller to the feeding solenoid. From this it is seen that the device is easily connected and installed. Once installed, it requires practically no maintenance and care. It operates entirely automatically and provides a perfect and steady feed of the carbons, thus giving the best possible light at the greatest economy. At the same time the attention of the operator is not continually distracted from other duties to feeding the carbons. Wherever tried out in motion-picture theaters the Auto-Arc controller has been found to do fully all that is claimed for it. It is manufactured by the American Auto-Arc Company, 390 Old Colony Building, Chicago, Ill.

McDonald Electric Deep-Well Pump and Water-Supply System.

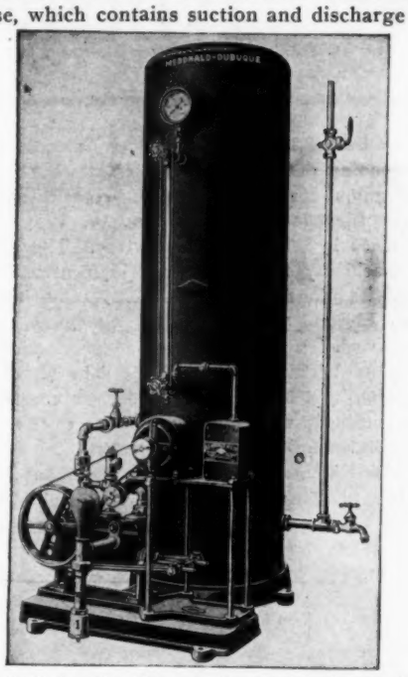
For supplying the water to residences, small apartments, etc., under pressure, the A. Y. McDonald Company, Dubuque, Iowa, is marketing the electrically driven deep-well pump, or working head, and the complete water-supply system shown, which includes a double-acting force pump. The pumps are operated by one-eighth and one-third-horse-



Electrically Driven Deep-Well Working Head.

power direct-current or alternating-current Westinghouse motors, designed for continuous service.

The deep-well pump is for direct-pressure systems. It is intended for use in wells where the water is from 25 to 100 feet from the surface. The pump has a capacity of from 120 to 180 gallons an hour, depending upon the size of the cylinder used. The standard is of cast iron bolted to the base, which contains suction and discharge pipe con-



McDonald Automatic Electric Water-Supply Equipment.

nections. The crosshead operates on two steel guide rods. The piston and packing gland are of brass, the latter having bolt adjustment. An air chamber of ample capacity is provided on the discharge line. An air compressor is regularly furnished and is driven from the crosshead, insuring a positive air supply to the tank at all times. A pressure tank of not less than 52 gallons capacity is recommended, though larger tanks are preferable. This pump is sold separately or as part of a system consisting of pump or working head, motor, air compressor, electric switch, cylinder, and pressure tank. The electric switch is designed to start the motor automatically when pressure falls to 20 pounds and stop it when pressure reaches 40 pounds.

The double-acting force pump is furnished as part of a complete water supply system for furnishing water from shallow wells and cisterns not over 25 feet deep. Motor, switch and pressure tank are included. The pump has a capacity of 180 gallons an hour and the entire outfit is mounted on a cast-iron bed plate, making an exceedingly compact and well arranged unit. Both outfits may be operated by current from an ordinary electric light socket or similar circuit outlet.

Portable Motion-Picture Plant.

Outdoor motion-picture photography at night has often been rendered impossible because of the inability of getting current for lighting purposes at the site where the work had to be done. One large New York film-producing concern has at last solved the problem by the design of a portable lighting plant. This consists of a large gasoline engine and electric generator mounted on a five-ton truck. This plant can supply sufficient light for the filming of night scenes and can reach any desired spot easily. The unit consists of an inclosed van-like body divided into two separate compartments. In the front compartment is a generator rated at 218 amperes and 120 volts. This is direct-driven by a five-cylinder water-cooled marine gasoline engine mounted in the rear compartment. The current supplied by the generator is carried to as many of the regular indoor studio arcs as are necessary.

INDUSTRY ACTIVITIES

The Franklin Electric Manufacturing Company, Hartford, Conn., is sending out a mailing folder which emphasizes the value of Franklin Mazda lamps as dispersers of shadows.

Marathon Electric Company, Wausau, Wis., is erecting an addition, 50 by 40 feet, to its factory. The company will add new machinery to its present equipment and double the capacity of its plant.

Wagner Electric Manufacturing Company, St. Louis, Mo., has awarded a contract for the construction of a new building in its Wellston plant group. The structure will be five stories, 60 by 400 feet, and of concrete construction, corresponding in style with the other plants of the group. The building will be finished in March, 1917.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is having plans prepared for a central office building and storage house for valuable records and patterns. It will be located at St. Paul Avenue and Twelfth Street and will cost about $150,000. Construction work will be started in the spring. The structure will be six stories and basement, 283 by 50 feet. It will be of reinforced concrete and will contain no wood of any kind. The upper two floors will be used for the general offices.

Pass & Seymour, Incorporated, Solvay, N. Y., have issued catalog No. 24, entitled "Handy Electric Wiring Devices," which is pocket size and 80 pages. In preparing the catalog the aim was to avoid all unnecessary or complex description and to rely upon illustrations to bring out points regarding the company's products. A comprehensive charting of interchangeable parts is given, these parts being classified into five groups: shells, caps, bases, flutolier and porcelain. The catalog will be valuable to any dealer or contractor.

The Automatic Reclosing Circuit Breaker Company, Columbus, O., has issued a compilation of bulletins it has recently prepared on its products. These bulletins give illustrations and descriptions of the different types of automatic reclosing circuit-breakers manufactured by the company, as well as data on the protection of individual motor circuits, theory and operation of automatic reclosing circuit-breakers and the necessity for their use. The company has also issued bulletin No. 8, on relays for use in connection with this type of breaker on direct-current circuits.

Westinghouse Lamp Company, 165 Broadway, New York City, in the October and November issues of "How I Did It," which contains short stories of incandescent lamp sales written by salesmen, presents some very instructive material. These stories are contributed by lamp salesmen throughout the country, who give from their own experiences. The contributions accepted are paid for, prizes being given for the best two stories each month. Contributions will be received from any one in the employ of an electrical jobber, dealer, contractor or central station. On request the company will send the publication without charge to those interested.

The Electric Vehicle Market.—At the meeting of the Chicago Electric Vehicle Section of the National Electric Light Association held on November 21, J. J. Rockwell, of New York, delivered a very interesting address entitled "The Electric Vehicle Market—Its Possibilities, Profits and Limitations." Mr. Rockwell traced the development of the electric-vehicle industry and predicted that within the next few years there will be ten times as many electric passenger cars in use as at present. He said the public is rapidly coming to realize that the electric car embodies every feature that is desired in an automobile.

Harvey Hubbel, Incorporated, Bridgeport, Conn., has issued a list of trade discounts, effective November 20, on reflectors, shade holders, lamp guards, pull switches, attachment plugs, receptacles, etc.

Stow Manufacturing Company, Binghamton, N. Y., has issued a miniature of its bulletin No. 102, on flexible shafts. The original bulletin was photographed and reduced to a size of 3¼ by 4⅞ inches, making a convenient size for ready reference and complete in every detail. Over 25,000 of these miniature bulletins are being mailed to the trade.

Show-Window Advertising Device Earns Praise.—Among the innumerable displays, devices and illusions to attract the attention of the passing throng at the New York State Association Exposition at the Grand Central Palace, New York City, November 21-25, the Animated Advertising Company's new show-window device earned generous applause and unstinted praise. The demonstration of the actual working of the Automatic Electric Company's telephone service, showing the advantage in time saved, privacy of talk and economy of operation, appealed to those interested in modern methods of advertising.

Western Electric Company has concentrated its salesrooms, warehouse and offices in Boston under one roof, having occupied a new building recently completed for its exclusive occupancy at 385 Summer Street. The building consists of three stories, a basement and shed, the total floor space being 93,000 square feet. An ideal warehousing layout is being installed, consisting of electric power conveyors and spiral chutes. A sidetrack from the New Haven railroad provides convenient shipping facilities. The company's former salesroom at 115 Purchase Street, has been abandoned, but telephone connection is maintained from that location with the new offices.

Westinghouse Electric Grants Employees a Bonus.—Announcement has been made by the Westinghouse Electric & Manufacturing Company of an extension of its present bonus system to include salaried, and office employees on hourly rates, by which they will receive a bonus of eight per cent of their salary each month providing their total excusable time absent and late during the month does not exceed six hours incurred on not over three occasions. An additional four per cent will be given each month to the employee who has not lost any time from work during the month through absence or tardiness, thus enabling those affected to obtain an increase in earnings of 12 per cent for full attendance. Several thousand employees in the Pittsburgh district are benefitted by the granting of the bonus.

T. I. Jones Lectures on Lamp Development.—On November 13, Theodore I. Jones, general sales agent of the Brooklyn Edison Company, gave a very interesting talk before the Mutual Welfare League at Sing Sing Prison, on "The Development of the Incandescent Lamp." Mr. Jones exhibited a great many lantern slides showing the incandescent lamp from its earliest stage, to the most highly developed lamp of today. An interesting motion picture was run off showing the manufacture of Mazda lamps in one of the large lamp factories. Mr. Jones' talk was very enthusiastically received by the members of the League. Mr. Jones and his party were given the unusual opportunity of visiting all parts of the prison and were able to get an insight into things that the usual visitor has no opportunity to see.

PERSONAL AND BIOGRAPHICAL

DR. ELIHU THOMSON, one of the founders of the Thomson-Houston Company, the predecessor of the General Electric Company, president of the International Electrotechnical Commission, past president of the American Institute of Electrical Engineers, and noted for his experimental work in alternating-current induction and the development of electric welding and other electrical apparatus, will be the recipient of the John Fritz Medal, at a presentation to be made December 8, at a meeting in the Central Lecture Hall of the new buildings of the Massachusetts Institute of Technology, Boston. The medal was awarded in January, 1916, to Dr. Thomson "for achievements in electrical invention, in electrical engineering, in industrial development and in scientific research." It was provided for in a fund subscribed to the memory of the great engineering pioneer, John Fritz, and is awarded from time to time by a permanent board composed of four members from each of the following societies: the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the American Institute of Electrical Engineers. The program of the evening will include addresses by John J. Carty, chief engineer of the American Telephone & Telegraph Company, and chairman of the presentation committee of the Board of Award; E. W. Rice, Jr., president of the General Electric Company, and Richard C. Maclaurin, president of the Massachusetts Institute of Technology. The presentation will be made by Charles Warren Hunt, and the ceremonies will conclude with the response of Dr. Thomson.

Elihu Thomson.

MR. M. R. GRIFFETH, of the General Electric Company, Boston, addressed the Cumberland County Power & Light Company Section of the American Electric Railway Association at Portland, Me., November 15, on the electrification of the Chicago, Milwaukee & St. Paul Railway in Idaho and Montana.

MR. HERBERT H. KAHM, formerly electrical engineer for the Carpenter Steel Company, Reading, Pa., has accepted the position of assistant superintendent of the Harrisburg (Pa.) Light & Power Company.

MR. ARTHUR V. FARR, for the last three years advertising manager of the SKF Ball Bearing Company, Hartford, Conn., has accepted the position of sales manager of the Hess Steel Corporation, Baltimore, Md.

MR. A. H. SIKES has been appointed manager of the Stevens Point (Wis.) Lighting Company, recently acquired by the Wisconsin Valley Electric Company, which operates power plants in Wausau, Mosinee and Merrill, Wis.

MR. J. T. SHERLOCK, local manager for the East Haddam Electric Light Company, at Glastonbury, Conn., has been transferred to Hadlyme, and MR. FRANK HUSSEY has been assigned to the managership at Glastonbury.

PROF. C. E. CLEWELL, assistant professor of electrical engineering in the University of Pennsylvania, is at the residence of his father in Bethlehem, Pa., recovering from an attack of typhoid fever, from which he has been suffering for a month past.

MR. CLARENCE RENSHAWM, of the railway engineering department of the Westinghouse Electric & Manufacturing Company, delivered an address on November 15, before the Memphis (Tenn.) Engineers' Club, on the subject of the electrification of railroads. He pointed out the merits and disadvantages of this method of traction under various conditions.

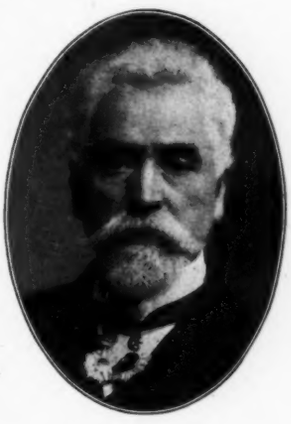
MR. NORMAN McD. CRAWFORD, president of the Reading (Pa.) Transit & Light Company, has been made vice-president and acting president of the Columbus (O.) Railway & Light Company, his duties as acting president being in place of President McMeen, who has been ill for some time. Mr. Crawford was formerly president of the Mahoning & Shenango Railway & Light Company, Youngstown, O.

OBITUARY.

MR. CHARLES W. WARREN, vice-president of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., was killed by the overturning of his automobile near Butler, Ind., November 16. He was 42 years old, and resided in Chicago.

MR. JOHN T. BRADY, for 18 years treasurer of the Denver Gas & Electric Light Company, died November 22, in Colorado Springs, Colo. His health failed three years ago, when he was forced to lighten his work, and last summer he went to Colorado Springs to recuperate. The exposure of a hunting trip hastened his death. Mr. Brady was identified with practically all civic movements in Denver. As an official of the company he served since he was 19 years old he made many friends in the electrical field.

SIR HIRAM S. MAXIM, best known for his invention of the automatic rapid-fire gun, but also noted for inventions in other lines, died in London, England, November 24. Besides inventing smokeless powder and other explosives, contributing to the science of aerial navigation, he patented numerous electrical devices. From 1878 to 1881 he was manager of the United States Electric Lighting Company, New York City, and during this period patented the process of the electrodeposition of carbon by heating carbon rods electrically in an atmosphere of hydrocarbon gases. This patent was followed by other electrical inventions, among them the first potential regulator for lighting systems. In those days he was one of the foremost inventors in the electrical engineering field. Hiram Maxim was born in Sangerville, Me., in 1840, and after reaching his majority was connected with various engineering enterprises, his most important work being inventions of machinery for the manufacture of carbureted air. In 1881 he went to England where he resided most of the time until his death. The automatic gun was invented in 1882 and was followed by "cordite," the Maxim smokeless powder. For his inventions, some of which revolutionized modern warfare, he was knighted by Queen Victoria in 1901.



Hiram S. Maxim.

MR. JAMES H. WHITAKER, assistant superintendent of the Puget Sound Traction, Light & Power Company, Seattle, Wash., died recently, aged 63 years. Mr. Whitaker was manager of the Northwest Engineering Company, St. Paul, Minn., from 1895 to 1909, and then joined the electrical enginering staff of the Northern Pacific Railway Company. Later he resigned to become city electrician of Tacoma, Wash., and after serving in that capacity several years entered the employ of the Seattle-Tacoma Power Company and remained with this company until it was merged with the Puget Sound Traction, Light & Power Company.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

AUGUSTA, ME.—The Public Utilities Commission has authorized Tomlinson & Colby, operating an electric utility at Rangeley, Me., to sell their rights and privileges to the Oquossoc Light & Power Company, and the latter to issue $50,000 capital stock and bonds of equal amount to effect the purchase of the above mentioned property and the distributing system owned by the Rangeley Light & Power Company. It will build a power plant and construct a transmission line.

BIDDEFORD, ME.—The York County Power Company will install additional street-lighting units here.

TURNER, ME.—A new power plant of the Turner Light & Power Company is nearing completion. Lighting service is being extended here and in Buckfield.

RUMFORD, ME.—Construction of a new dam and generating station for the Rumford Falls Power Company is being rushed night and day, large searchlights being used, which illuminate the whole area at the base of the falls. It is hoped to complete the under-water excavations before high water. The Cummings Construction Company is the contractor.

BARRE VT.—The Central Power Corporation, of which C. H. Thompson is general manager, is said to be ready to offer a rate of 1.7 cents per kilowatt-hour for energy in bulk to local manufacturers, contingent upon the city granting a franchise to do business. The territory is now served by the Montpelier & Barre Light & Power Company, which generates principally by water power. The Central Power Corporation plans to develop water powers and construct a steel-tower transmission line through Ripton, Lincoln, Hancock, Granville, Warren, Northfield and Barre, about 32 miles. Present power rates in large quanity are about 2 cents per kilowatt-hour.

BRATTLEBORO, VT.—The Twin State Gas & Electric Company, operating utilities in Vermont, New Hampshire and adjoining states, has moved its main office from Dover, N. H., to this city. Samuel Insull is president of the company, and Howard L. Olds is vice-president in charge of operation.

MONTPELIER, VT.—The Central Power Company has acquired a generating plant at Granby, P. Q., Canada, and plans to build a transmission line to Stevens' Mills and to Richford, Vt.

NEWMARKET, N. H.—The Rockingham County Light & Power Company, of Portsmouth, is erecting a high-tension transmission line into this city and will sell energy in bulk to the Newmarket Lighting Company.

ATHOL, MASS.—Ornamental street lighting, consisting of 1,000-candlepower Mazda C lamps in luminous-arc type lanterns on standards connected to underground system, is an important feature of a general improvement of Exchange Street in this town. The municipality constructed a new roadway and the property owners made wholesale improvements in the store fronts.

LEOMINSTER, MASS.—Mayor Henry F. Sawtelle is opposed to the proposal to acquire the electric and gas plants municipally.

LOWELL, MASS.—Plans for a central power plant for the high school group will be prepared by R. D. Kimball & Company, Boston, and bids asked for. The City Council, however, has not yet voted to construct such a plant, but desires to learn what its cost would be.

MARLBORO, MASS—This city has added about 40 incandescent street lamps to its system.

NEW LEBANON, MASS.—The Albany Southern Railroad Company is preparing to extend its transmission lines from Brainard to this place.

NORTHFIELD, MASS.—The City Council has appropriated $2,500 a year for street lighting and will make a contract with the Greenfield Electric Light & Power Company.

WEYMOUTH, MASS.—The Weymouth Light & Power Company plans extensions to its distribution system.

NEWTOWN, CONN.—The Danbury Electric Lighting Company, which furnishes service here, is planning the installation of an electric-lighting system in Sandy Hook.

EAST WILLIAMSON, N. Y.—The Town Board is contemplating the installation of additional street-lighting units. The Sodus Gas & Electric Light Company furnishes service.

LYNBROOK, N. Y.—The Civic Association is making plans for the installation of a municipal electric-lighting plant.

NEW YORK, N. Y.—The Ward Baking Company will build a new power house at its plant on Perkins Avenue. C. B. Comstock, New York, is architect.

ROCKVILLE CENTRE, N. Y.—A special election was held this week for the purpose of voting on an appropriation for $18,000 for the installation of a new generator in the powerhouse.

SODUS CENTER, N. Y.—Residents have petitioned the Sodus Town Board to establish a street-lighting district here and make a five-year contract with the Northern Wayne Light & Power Company.

HADDONFIELD, N. J.—The Haddonfield Civic Association is taking initial steps for the installation of a municipal electric-lighting plant.

LINDEN, N. J.—The Township Committee has authorized the immediate installation of a fire-alarm system.

NEWARK, N. J.—Following the preparation of plans for a garbage incinerator plant, Commissioner Gillen is interesting the Board of Works in the construction of a combination electric light and power and a garbage disposal plant on Elizabeth Avenue. It has been planned to build the municipal lighting plant following the operation of the incinerator, which is to be a 300-ton capacity and estimated to cost $250,000.

NEWARK, N. J.—The Board of Freeholders is considering the following improvements in the power plant at Overbrook Hospital, in accordance with a report submitted by its engineer: installation of new generator and two 150-horsepower boilers, construction of tunnels for underground piping and a vacuum return system for the heating plant. The work, including erection of addition to power station, is estimated to cost $60,300.

TRENTON, N. J.—The City Commission is considering a petition of residents of Phillips Avenue and Vine Street for the installation of additional street lamps.

CHAMBERSBURG, PA.—The United Electric Company has increased its capital from $103,500 to $1,000,000, to provide for existing indebtedness and proposed extensions and improvements.

DU BOIS, PA.—The installation of an ornamental lighting system in the business district is being planned. L. E. Weber is interested.

PHILADELPHIA, PA.—The Keystone Spinning Mills Company will build a new dynamo room and boiler plant at its factory on North Second Street.

PHILADELPHIA, PA.—The Philadelphia Rubber Company will build a new boiler house addition to its plant on Reed Street.

PHILADELPHIA, PA.—The Eagle Ice & Coal Company will build an addition to its engine room at its factory on Fifty-seventh Street.

PHILADELPHIA, PA.—The City Council has authorized the installation of 500 new street lamps, making a total of about 16,000 lamps in service throughout the city. The Philadelphia Electric Company will make the installation.

WILMINGTON, DEL.—The Ninth Street Association is making plans for the installation of an ornamental street-lighting system.

HYATTSVILLE, MD.—The installation of a municipal electric-lighting plant, to cost about $25,000, is contemplated.

DAWSONVILLE, GA.—Howser Brothers are planning to construct an electric-lighting plant here.

ABINGDON, VA.—The Abingdon Utilities Company has been incorporated with a capital stock of $100,000 by E. J. Prescott and others.

PILOT MOUNTAIN, N. C.—Improvements are being made to the local electric-lighting plant, of which G. W. Blum is owner.

NORTH CENTRAL STATES.

CINCINNATI, O.—Plans for the construction of an ornamental street-lighting system in the downtown district are being rushed, and the passage of an ordinance is awaiting only the determination of a method for fixing the city's share of the expense. According to members of the Citizens' Auxiliary Committee, which is assisting in the preliminary work, the construction of the ornamental lighting system on Sixth Street has greatly improved busiess on that thoroughfare, and the City Council is now unanimously in favor of similar lighting in the entire business district.

CLEVELAND, O.—The municipal lighting plant has submitted a new bid on the Cleveland Railway Company's power contract. If the contract is obtained, Lighting Commissioner Davis will recommend the purchase of two 15,000-kilowatt generators for the East Fifty-fifth Street station. In the event that the contract is not secured, a recommendation for the purchase of one generator will be made.

DAYTON, O.—The Dayton Power & Light Company is erecting a transmission line to Vandalia, one from Cedarville to South Charleston, and another to Englewood and Union.

MONROE, O.—The Middletown Gas & Electric Company will probably construct a line to this town in order to furnish energy for street-lighting and commercial purposes.

PIQUA, O.—The new schedule of rates for street lighting, to be agreed upon between the city and the local branch of the Dayton Power & Light Company, is being held up to await the determination of the City Council with reference to the proposed boulevard lighting system. Plans for such a system will be prepared by the company.

POMEROY, O.—The Pomeroy Utility Company has been incorporated with a capital of $1,000 by H. P. Collins and others to supply light and power here.

WASHINGTON, O.—Extensions and renewals of existing street-lighting equipment are planned by the Washington Gas & Electric Company, which probably will install an ornamental lighting system.

COALTON, ILL.—The Central Illinois Public Service Company has obtained permission from the Public Utilities Commission to construct a transmission line to this place, to furnish light and power.

DE KALB, ILL.—The De Kalb-Sycamore Electric Company is installing a new 500-kilowatt turbogenerator at a cost of about $25,000. According to Superintendent Conley, additional improvements are planned.

MOMENCE, ILL.—Plans are being made by the Commercial Club for the installation of an ornamental street-lighting system. Mr. Harpole is procuring data and estimates on the cost.

MONTGOMERY, ILL.—The Montgomery Hydrox Electric Company asked permission of the Public Utilities Commission to issue $100,000 stock and $100,000 bonds for the development of waterpower on the Fox River here. A decision will be made in a few weeks. This is the first case involving waterpower rights to come before the Illinois Commission.

NAMEOKI, ILL.—The Public Utilities Commission has given permission to the Madison County Light & Power Company to construct a transmission line from Granite City to Nameoki, to furnish electric service. The company operates in Granite City, Brooklyn, National City, Madison, Wood River and East Alton.

PEORIA HEIGHTS, ILL.—The franchise of the Peoria Railway Company has been revoked by the Village Trustees. The Peoria & Chillicothe Interurban Railway Company is seeking a franchise here.

SHERRARD, ILL.—The Sherrard Power Company has been incorporated with a capital of $30,000 by D. W. Bowen and others, to establish and operate an electric power plant.

TUSCOLA, ILL.—The City Council has passed a resolution calling for the installation of an ornamental street-lighting system in the business district.

WOOD RIVER, ILL.—The Madison County Light & Power Company has filed an application with the State Utilities Commission asking for a certificate of convenience and necessity to build a line from Wood River to the village of Hartford.

GRAND RAPIDS, MICH.—Work on the new dam on the Manistee River, which is being erected by the Consumers Power Company, is progressing rapidly. The work of cement pouring will soon begin. It will take about a year and a half to complete the installation, which will give the company an additional capacity of 22,000 horsepower.

GRESHAM, WIS.—The Gresham Electric Lighting & Power Company has been granted a franchise to construct and operate an electric-lighting plant here.

MILLTOWN, WIS.—A 25-year franchise has been granted to A. O. Dahlberg, of Clam Falls, for the erection and operation of an electric-lighting system here. Energy probably will be secured from the plant at Balsam Lake.

PARK FALLS, WIS.—Plans will be prepared by T. W. Orbison, engineer, Appleton, Wis., for a hydroelectric plant to be erected by the Franklin Paper Company on Flambeau River near here.

PORTAGE, WIS.—Engineers Woodmansee and Davidson, 208 LaSalle Street, Chicago, Ill., are preparing plans for a power plant to be erected here by the Southern Wisconsin Power Company of Milwaukee.

RACINE, WIS.—The Racine Auto Tire Company will build a new power plant.

STANLEY, WIS.—The Wisconsin-Minnesota Light & Power Company has purchased the electric plant operated by the Northwestern Lumber Company here. It is announced that the new owner will extend to this city the high-tension transmission line which runs from Chippewa Falls to Boyd.

STOUGHTON, WIS.—A company is being organized by Walter Hinge and others to provide electric service in the suburbs of this city.

THORP, WIS.—It is reported that the municipal electric-lighting plant will be sold to the Wisconsin-Minnesota Light & Power Company, of Chippewa Falls, and that this company will extend its transmission lines to this city.

BELTRAM, MINN.—Architect E. F. Bromhall, of Duluth, has completed plans and will superintend the construction of $35,000 school building. The specifications include equipment for a manual training department and complete heating, ventilating and electric-lighting plant.

GAYLORD, MINN.—The municipal electric-lighting plant has been sold to the Northern States Power Company, which will furnish electric service from its transmission lines now being extended west from Minneapolis.

ST. PAUL, MINN.—The St. Paul Gas Light Company, F. A. Otto, superintendent, is contemplating improvements to its plant, including the installation of turbines, boilers, pumps, switchboard apparatus and transformers.

BUFFALO, IOWA.—The city is planning to grant a franchise for the installation of an electric-lighting system.

ELMA, IOWA.—The Consumers Electric Company has been granted a 25-year franchise to erect and operate a transmission line between Elma and Riceville.

GUTHRIE CENTER, IOWA.—The Iowa Railway & Light Company, Cedar Rapids, contemplates the installation of a 100-kilowatt generating unit at its power plant. C. T. Harney is manager.

MOUNT VERNON, IOWA.—Arrangements have been completed by the Wapsie Power & Light Company, Mount Vernon, for the extension of a transmission line to West Branch.

NORA SPRINGS, IOWA.—The Nora Springs Light & Power Company has increased its capital stock to $25,000. Plant improvements are contemplated.

ST. LOUIS, MO.—Arthur M. Branch, Commissioner of Light, Heat and Power, is making a survey to determine the feasibility of establishing a municipal electric-lighting plant. An appropriation of $12,500 has been made for this purpose, and a survey will be made of existing transmission lines, both overhead and underground, together with a house-to-house canvass, to ascertain the connected load of the operating companies.

HAYS, KANS.—The city has voted to issue $29,033 in bonds to purchase the plant of the Hays Electric Light Company. The transfer will be made January 1.

WETMORE, KANS.—This town, which gained prominence because it operates its electric-lighting plant Tuesdays so that service for electric irons is afforded, will install additional equipment to give 24-hour service.

OMAHA, NEB.—The Omaha, Lincoln & Beatrice Interurban Company is considering the construction of an electric line from Lincoln to Omaha. J. M. Bramote is general manager.

BRUCE, S. D.—The City Council has entered into a contract with O. Nelson, who will be manager of the electric-lighting plant recently purchased by the city.

BUSHNELL, S. D.—A franchise has been granted to the Dakota Light & Power Company, Flandreau, S. D., to supply the city with electric service.

FLASHER, N. D.—Harry Thorberg and John Bunting, Mandan, N. D., have been granted a franchise to install an electric-lighting system here.

DATES AHEAD.

American Physical Society, University of Chicago, Chicago, Ill., December 2, Secretary, A. D. Cole, Columbus, O.

United States Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, Ill., December 5-8. Secretary, W. S. Vivian, 19 South La Salle Street, Chicago, Ill.

American Society of Mechanical Engineers. Annual meeting, New York City, December 5-8. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

Kansas Public Service Association. Annual meeting, Topeka, Kans., December 7-8. Secretary, E. A. Wright, Manhattan, Kans.

American Institute of Electrical Engineers. Monthly meeting, Boston, Mass., December 8. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

American Association for the Advancement of Science. Annual meeting, New York City, December 26-30. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

American Institute of Chemical Engineers. Annual convention, New York City, January 10-13, 1917. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual meeting, Hotel Wisconsin, Milwaukee, Wis., January 15-17. Secretary, Albert Peterman, 626 Lloyd Street, Milwaukee.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 12-14. Secretary pro tem., E. A. Thiele, Roswell, N. M.

SOUTH CENTRAL STATES.

ALEXANDRIA, KY.—The Alexandria Public Service Company has been incorporated with a capital of $2,000 to furnish electric service here. C. W. Shaw is interested.

GLASGOW, KY.—Purchase of the holdings of the Glasgow Electric Light & Ice Company by the Kentucky Utilities Company is announced. The City Council has approved a 20-year franchise. Rates are 13.5 cents for residence lighting and 11 cents for commercial lighting, subject to a discount of one cent for prompt payment. It is reported that the purchasing company paid $100,000 for the property and that it will establish a central station here to supply the surrounding cities.

ARLINGTON, TENN.—The city is planning to build a combined waterworks and electric-lighting plant.

BEARDEN, TENN.—The Bearden Welfare Association has started a movement looking toward the construction of a hydroelectric plant. Prof. J. A. Switzer, University of Tennessee, Knoxville, has been asked to make investigations. The cost will be about $5,000.

MEMPHIS, TENN.—The Shelby County Industrial School at Ellendale has been given an appropriation of $2,000 to establish an isolated lighting plant.

MEMPHIS, TENN.—The $1,500,000 bonds for the erection of a municipal electric-lighting plant have been sold by the City Commissioners to four bond houses of Cincinnati and New York. A provision was made that upon payment of $15,000 the city may cancel the issue in 30 days in case an agreement is reached with the two private lighting companies.

REDBOILING SPRINGS, TENN.—The Redboiling Springs Light Company has been incorporated with a capital stock of $2,000 by J. B. Birdwell and others to install and operate an electric-lighting plant.

CLANTON, ALA.—The Alabama Power Company has secured a franchise to operate an electric-lighting plant here.

MONROEVILLE, ALA.—The city is considering the construction of a hydroelectric plant to develop about 1,000 horsepower, to cost between $30,000 and $40,000. L. G. Bugg is interested.

ARKANSAS CITY, ARK.—The Lambe & Denmarke Light & Water Company will establish an electric-lighting plant. An oil-engine drive will be installed.

COTTON, ARK.—A number of citizens, including L. D. Goodrich, have been given a franchise to install an electric-lighting plant here.

BARTLESVILLE, OKLA.—The Oklahoma & Northwestern Traction Company, recently incorporated, will begin construction work on an east and west interurban road out of this city. The new road will run between Bartlesville, Nowata, Miami and Joplin, with branches from Miami to Columbus and Baxter Springs, Kans. Kansas City promoters are back of the proposed road.

COLLINSVILLE, OKLA.—The City Commissioners are making plans for extensions to the local electric-lighting plant.

TULSA, OKLA.—The Public Service Company of Oklahoma has moved its headquarters from Oklahoma City to Tulsa. This company operates public utilities in a number of cities and villages in Oklahoma. Ered W. Insull is president.

BEEVILLE, TEX.—The City Council plans to purchase the local electric-lighting plant from the Texas Southern Electric Company.

BRADY, TEX.—The city will make improvements to the electric-lighting and water plant and is planning to install a new street-lighting system.

FORNEY, TEX.—The Texas Power & Light Company, of Dallas, plans to extend a transmission line to this place and install a street-lighting system.

GARWOOD, TEX.—J. J. Cooper and associates are constructing an electric light and power plant here.

PACKSBORO, TEX.—The Jacksboro Mill & Elevator Company, which operates the local electric-lighting plant, will install new machinery.

NEWCASTLE, TEX.—The Newcastle Light & Power Company has been granted a franchise by the City Council and will begin work immediately on the erection of the lighting system and rush it to completion.

NORDHEIM, TEX.—The Texas Southern Electric Company has been investigating the situation here with a view of extending a transmission line to the town and installing a lighting system.

SAN ANTONIO, TEX.—The government telephone system at Fort Sam Houston is to be enlarged. A new switchboard and 15 additional trunk lines between the city and the army post will be installed.

STREETMAN, TEX.—The Corsicana (Tex.) Gas & Electric Company has made a proposition to the City Council for installing an electric light and power plant here.

TERRELL, TEX.—An election was held here this week to determine whether or not the city light plant shall be sold to the Texas Power & Light Company. The question of amending the city charter, changing the life of the franchise from 30 to 50 years, was also considered.

WESTERN STATES.

BUTTE, MONT.—The City Council has passed a resolution which calls for the lighting of Oak, Cherry and intersecting streets.

GREAT FALLS, MONT.—Machinery en route to the local power plant of the Great Falls Power Company, and valued at $75,000, was completely destroyed by a fire in Butte last week.

ROUNDUP, MONT.—Plans are under way for the extension of the lighting sys-

tem now in operation in the business district and for the installation of another ornamental system to cover the entire west side residence section of the city.

MOGOLLON, N. M.—A representative of the State Engineer's office has been here securing data and inspecting proposed hydroelectric sites.

YUMA, ARIZ.—Articles of incorporation have been filed for the Yuma Light, Gas & Water Company, with a capital stock of $200,000, by R. M. Moore, D. F. Hill and Frank X. Pfaffinger, all of Los Angeles, Cal.

RENO, NEV.—The Gardnerville and Douglas County Milling & Power Company, which operates a large mill and electric-lighting system at this place, will be enabled to make extensive improvements in its lighting system as soon as its large storage dam is completed.

BOISE, IDAHO.—J. E. Goodman, of New Meadows, has applied for a certificate of public necessity and convenience to furnish electricity to the towns of Cascade, Arling, Donnelly, Roseberry and Van Wyck. He proposes to construct a plant on the north fork of the Payot River at Lardo.

SHELLEY, IDAHO.—The Shelley Light & Power Company has applied for a certificate of convenience and necessity which will permit it to furnish electricity here under the terms of a new franchise.

CASHMERE, WASH.—A public meeting is to be held shortly to discuss the proposition of a bond issue for the construction of a municipal electric-lighting plant.

HOQUIAM, WASH.—The proposal to vote $175,000 in bonds for the purchase or condemnation of the distribution system of the Grays Harbor Railway & Light Company was defeated at the polls.

NORTH YAKIMA, WASH.—The Union Land & Power Company has been incorporated with a capital of $100,000 by M. A. Friedline, George D. Foster and others.

OKANOGAN, WASH.—The application of the Colville National Forest Department of Agriculture for a franchise to construct telephone lines upon the roads of Okanogan County will be heard on December 5.

OLYMPIA, WASH.—The North Pacific Public Service Company has filed a tariff with the Public Service Commission indicating its intention to run a submarine cable from Port Orchard to Bainbridge Island to supply residents with energy for lighting.

SEATTLE, WASH.—J. F. Starr, illumination engineer of the American Lighting Company, Chicago, Ill., is in Seattle to supervise the installation of lighting systems in the plants of the Seattle Construction & Dry Dock Company and the Skinny-Eddy Corporation.

MYRTLE CREEK, ORE.—The Town Council will receive bids up to December 5 for the construction of an electric-lighting plant.

OREGON CITY, ORE.—The generator in the new power plant of the Hawley Pulp & Paper Company was damaged to the extent of $6,000 by fire a short time ago.

PORTLAND, ORE.—Principal C. E. Cleveland of the Portland Boys' School of Trades is planning to install a power plant especially adapted for giving instruction in operative egineering.

PORTLAND, ORE.—The Monark Mills Company has been incorporated with a capital of $2,500,000 to extend the Oregon Electric line to Cascadia to assist in lumbering operations. The new company was organized by Lester W. David and other Portland financiers, with George F. Heusner as president.

BAKER, ORE.—A. J. Snyder has been granted a franchise for an electric power line to Buck Gulch.

ANGELS, CAL.—Arrangements are being made for the construction of a transmission line from the San Francisco & Sierra Power Company's main line at Altaville to the Pioneer Shaft of the Angels Deep Mining Company.

CHICO, CAL.—The Board of Trustees has instructed the City Engineer to prepare plans and specifications for a new electrolier lighting system.

FRESNO, CAL.—The contract for an electrolier lighting system has been awarded to the Mt. Whitney Power & Electric Company on its bid of $2,900.

LOS ANGELES, CAL.—The Pacific Light & Power Corporation has applied for a lighting franchise in Monterey Park.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded the contract for installing lamps and furnishing energy in the Norwalk lighting district.

LOS ANGELES, CAL.—The Board of Public Works, considering the bids received too high, will readvertise for bids for the installation of ornamental lights on Adams Street, between Grand Avenue and Figueroa Street.

MARYSVILLE, CAL.—A representative of the Great Western Power Company was in this section recently to secure a right of way for a new power line from the plant at Big Bend, Plumas County.

PLACERVILLE, CAL.—While the Railroad Commission has taken no action of the application of the Western States Gas & Electric Company to purchase the Big Ditch water system from the Baring interests, the power company has already done considerable improvement work on the property under the supervision of William Albright.

POMONA, CAL.—Nearly the entire section of the city lying between Alvarado, Holt, San Antonio and Garey Avenues has been signed up for electric lights, and the matter will soon be brought before the City Council.

SAN FRANCISCO, CAL.—Upon their return from a trip over the entire system of the California-Oregon Power Company, Paul B. McKee, assistant to the president, and J. C. Thompson, assistant to the secretary, reported that work is being started on a seven-mile transmission line from Hornbrook to Hilt, Siskiyou County.

SANTA BARBARA, CAL.—Steps have been taken toward creating a lighting district on State Street.

VISALIA, CAL.—The contract for the installation of a system of ornamental street lights on West Main Street from Encina Avenue to the city limits has been awarded to the Mt. Whitney Power & Electric Company on its bid of $1,450.

WOODLAND, CAL.—The Pacific Telephone & Telegraph Company has applied to the Railroad Commission for a certificate that public convenience and necessity require the exercise by it of franchise rights granted by this city. The company has been for a long time operating a telephone system in Woodland and now proposes to extend it.

New Incorporations

CHICAGO, ILL.—Capital Electric Company has increased its capital stock from $75,000 to $100,000.

BROOKLYN, N. Y.—West End Electrical Company. Capital, $1,000. Incorporators: C. R. O'Neill and Henry Marx.

CHICAGO, ILL.—Bridgeport Electric Company. Capital, $25,000. Incorporators: A. Bertkus, L. Dombrowski and E. Barkus.

CLEVELAND, O.—Farad Electric Company. Capital, $500,000. Manufacture motors. Incorporators: E. A. Foote, A. R. Manning, Jr., F. S. McGowan and others.

DOVER, DEL.—Keystone Utilities Company. Capital, $5,000,000. Incorporators: Herbert E. Latter and Norman P. Coffin, Wilmington, Del., and Clement M. Egner, Elkton, Del.

CEDAR RAPIDS, IOWA.—Dows, Smith & Reed. Capital, $100,000. To promote public utilities. Incorporators: William G. Dows, Isaac B. Smith, John A. Reed, S. C. Dows and C. L. Van Valkenburg.

DOVER, DEL.—Maxon Brothers Company. Capital, $100,000. Electrical and mechanical engineers. Incorporators: Harry H. Phillips, Frank J. Carroll and Charles J. Horn, all of Chicago, Ill.

NEWARK, N. J.—Simplex Instrument Company. Capital, $125,000. To manufacture battery meters and similar specialties. Incorporators: Edward W. McDonough, Orange, N. J.; Frederick Beck and R. G. Higgins, Newark.

Financial Notes

Pacific Light & Power Company, through the United States Mortgage & Trust Company, has called for tenders to December 6 of as many of its first and refunding mortgage bonds as can be purchased for $251,789, now available for the sinking fund.

Stockholders of the Thomson Electric Welding Company voted to authorize an increase in the stock to $500,000. The capital now outstanding is $192,040. It is proposed to issue $15,000 new stock immediately and the issue has been underwritten.

The Electric Cable Company, of Bridgeport, Conn., recently filed a certificate raising its authorized capital stock from $1,000,000 to $1,500,000. The shares of the company have been proportionately increased from 5,000 preferred and 5,000 common to 10,000 preferred with the same number common, par value $100.

At a meeting of the board of directors of the Colorado Power Company held recently a resolution was adopted making the dividends on the common stock of the company payable quarterly on the fifteenth day of January, April, July and October to stockholders of record the last day of the preceding month. Heretofore dividends have been paid semi-annually. Checks will be mailed by William P. Bonbright & Company, Incorporated, dividend disbursing agents.

By the sale of $3,500,000 of preferred stock, which has been taken by Harper & Turner, of Philadelphia, the Mahoning & Shenango Railway & Light Company, of Youngstown, O., has been enabled to take care of an outstanding issue of notes, amounting to $3,000,000, which, it is understood, will be called in at 101.5 and accrued interest, as they are not due until December 1, 1918. The retirement of these notes will leave the company without obligations other than that of the common and preferred stock.

The United Light & Railways Company has sold to William P. Bonbright & Company, of New York City, $1,500,000 of 10-year six-per-cent convertible debentures. These will be offered in the near future at a price not yet determined. The debentures are a direct obligation of the company and are callable at 102 in the first five years, at 101 in the second five-year period, and are convertible into six-per-cent preferred stock of the company on and after two years from November 1, 1916. The proceeds of the debentures will be used to retire over $400,000 of underlying bond issues, for the payment of a small amount of floating debt, and the balance for construction requirements of the subsidiary company during the year 1917. The sale of the debentures is declared to strengthen the company, said to be already in a fine financial condition. For the 12 months ending September 30, 1916, the gross earnings of the company are $6,760,507, and the net profit before dividends is $1,145,414. The company contemplates no extensive improvements, but the growth of business in the communities served will require additional outlays for expansion during the year 1917, for which the company has provided in advance.

Directors of American Telephone & Telegraph Company at a meeting authorized an issue of stock in the ratio of one share of new stock for each ten now held. This entails issuance of approximately $40,000,000 additional stock, which will be offered shareholders at par. Stock will be payable in four installments, first one February 1, 1917, and remaining three installments at intervals of three months each. The new telephone stock is offered to stockholders of record December 11, 1916, and the rights to subscribe expire June 22, 1917. Payments of the first three installments will

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 27.	Nov. 20.
American Telephone & Telegraph (New York)	127⅞	132¾
Commonwealth Edison (Chicago)	142	142
Edison Electric Illuminating (Boston)	231	232
Electric Storage Battery common (Philadelphia)	70½	70½
Electric Storage Battery preferred (Philadelphia)	70½	70½
General Electric (New York)	180¾	182
Kings County Electric (New York)	125	130
Massachusetts Electric common (Boston)	4½	4⅝
Massachusetts Electric preferred (Boston)	29¼	30
National Carbon common (Chicago)	290	300
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	126	123
Philadelphia Electric (Philadelphia)	29¾	29⅝
Postal Telegraph-Cables common (New York)	84½	85
Postal Telegraph-Cables preferred (New York)	65	65½
Western Union (New York)	102	101½
Westinghouse common (New York)	64½	65¼
Westinghouse preferred (New York)	72	72

bear interest from their due date until November 1, 1917, when the last installment is due, and the interest rate will be the same as the dividend rate of eight per cent. Installments are payable February 1, May 1, August 1, and November 1. Subscriptions in England will be handled through Baring Brothers, and in Holland through Hope & Company. American Telephone & Telegraph management and directors have decided the present offers favorable opportunity to finance maximum construction and refunding requirements for all of 1917 and 1918. With this object in view, directors have authorized, in addition to 10 per cent of new stock to be offered shareholders at par, an issue of $80,000,000 five-per-cent 30-year collateral trust bonds. These bonds have been sold to a Boston-New York banking syndicate and by them will be offered to investors. Bonds are not a part of present collateral trust issue, of which $78,000,000 are outstanding, but are a new issue, and bearing five per cent and running for 30 years.

The plan for refinancing and reconstructing the corporate affairs of the Philadelphia Electric Company has been announced by Joseph B. McCall, president of the company. Under the new arrangement the system will be consolidated and extended to give larger service than heretofore. The present New Jersey corporation will be liquidated when the plan shall be fully consummated. In its place will stand the Philadelphia Electric Company of Pennsylvania, now the chief operating company. Its capital stock will be increased to $50,000,000 authorized, of which half will be issued in exchange for the $25,000,000 capital stock of the New Jersey company, which will be full paid next month by the assessment of $2.50 per share just called for payment. The company will create a mortgage on all its properties for $60,000,000 under which $35,000,000 of bonds presently will be issued in exchange for $28,276,502 of collateral trust certificates now outstanding and to provide additional capital for construction expenditure. The bonds to be issued have been underwritten by a strong syndicate organized by Drexel & Company. President McCall stated that under the plan for the retirement of trust certificates of the Philadelphia Electric Company, more than 95 per cent of each class of certificates had now been deposited with the depository. This, under the terms of the agreements securing the issues, he said, will enable the company to retire the certificates as contemplated by the plan, as announced in its circular issued on July 20, 1916, and to proceed with the refinancing of the company. Such legal steps, he announced, will now be proceeded with as are necessary to carry out the entire plan for refinancing and reconstructing the corporate affairs of the company.

Dividends.

	Term	Rate	Payable
Am. Pw. & Lt., com	Q	1 %	Dec. 1
Am. Tel. & Cable	Q	1.25%	Dec. 1
Baton Rouge Elec., pf	S	$3.00	Dec. 1
Baton Rouge Elec., com	S	$4.00	Dec 1
Blackstone Val. Gas & Elec.	Q	2 %	Dec. 1
Eastern Pw. & Lt., pf	Q	1.75%	Dec. 15
Louisville Trac., com	Q	1 %	Jan. 1
Montana Pw., pf	Q	1.75%	Jan. 2
Montana Pw., com	Q	1 %	Jan. 2
No. Ohio Trac. & Lt., com	Q	1.25%	Dec. 15
Pens. Elec., pf	S	$3.00	Dec. 1
Pens. Elec., pf	Acc.	$1.50	Dec. 1
Rochester Ry. & Lt., pf	Q	1.25%	Dec. 1
Shawinigan Water & Pw.	Q	1.75%	Jan. 10
Tenn. East. Elec., pf	Q	1.5 %	Dec. 1
Texas So. Elec., pf	Q	1.5 %	Dec. 1
Wash. (D. C.) Ry. & Elec.	Q	1.75%	Dec. 1
Wash. (D. C.) Ry. & Elec., pf	Q	1.25%	Dec. 1
Wis.-Minn. Lt. & Pw., pf.	Q	1.75%	Dec. 1

Earnings.

AMERICAN POWER & LIGHT.

American Power & Light Company reported consolidated earnings of its subsidiaries for October and the 12 months ended October 31 as follows:

	1916	1915
October gross	$ 726,727	$ 668,175
Net after taxes	348,043	307,545
12 months' gross	8,322,183	7,751,362
Net after taxes	3,890,450	3,534,099

Proposals

CABLE.—Sealed proposals will be received at the office of the chief signal officer, War Department, Washington, D. C., until December 9, for furnishing cable in accordance with specifications which may be had on application to the above-named office. Refer to proposal No. 891.

LAMP GLOBES.—Sealed bids will be received by the South Park Commissioners, Fifty-Seventh Street and Cottage Grove Avenue, Chicago, Ill., until December 20, for furnishing and delivering to the South Park store yard, 300 18 by 7-inch translucent electric lamp globes.

WIRE AND CABLE.—Sealed bids will be received by the Department of Gas and Electricity, at Room 614, City Hall, Chicago, Ill., until December 5, for furnishing and delivering sundry kinds and sizes of wire and cable, in accordance with specifications on file in the office of the Commissioner of Gas and Electricity.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 398, Washington, D. C., 725 pounds ebonite or hard rubber. Schedule 398, Newport, R. I., two muffle type electric furnaces. Schedule 406, Brooklyn, N. Y., miscellaneous shafts, rotor, disks, etc. Schedule 406, Boston, Mass., four transmitters and indicators combined. Schedule 407, Philadelphia, Pa., two generating sets. Schedule 430, Brooklyn, N. Y., 35 testing generators. Schedule 431, Brooklyn, N. Y., 5,000 feet of interior communication cable, 2,000 feet of single-conductor wire and 60,000 feet of twin-conductor wire. Schedule 436, f. o. b. works, 32,000 combination fuses. Schedule 439, Brooklyn, N. Y., 24 portable electric drills. Schedule 455, Mare Island, Cal., 25 electric soldering irons. Bidders desiring to submit proposals should make application to the Bureau or to the nearest navy yard purchasing office.

Electrical Patents Issued November 21, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,205,150. **Coin-Collector for Telephone Systems.** J. J. Brownrigg, H. Henderson and A. E. Case, assignor to Delta Electric Co., Marion, Ind. Toll-collection apparatus.

1,205,156. **Electrical Dental-Engine.** W. E. Buttle, Perry, Iowa. Motor structure.

1,205,167. **Ignition System.** S. Deutsch, Detroit, Mich. Special arrangement of induction coil, timer, plugs, etc.

1,205,181. **Regulating Electrical Systems.** G. R. Fessenden, Jr., assignor to Gould Coupler Co., New York, N. Y. Car-lighting system.

1,205,193. **Train-Stopping Apparatus.** A. X. W. Grondin, Thetford Mines, Quebec, Canada. Track instrument controls circuit on train controlling throttle and brakes.

1,205,194. **Igniting Mechanism for Internal Combustion Engines.** W. Grunow, assignor to J. F. Alvord, Torrington, and W. B. Thompson, New York, N. Y. Make-and-brake device.

1,205,196. **Lighting Fixture.** E. F. Guth, St. Louis, Mo. Manner of securing socket in canopy.

1,205,197. **Commutator.** H. Haage, assignor to Siemens-Schuckert-Werke G. M. B. H., Berlin, Germany. Special clamping rings.

1,205,207. **Process and Apparatus for Recovering Metals From Liquids.** C. E. Holland, assignor to Metals Electro Recovery Co., Arizona. Intermittently reversed current is passed through liquid and the settlings after treatment with cyanide are electrolyzed.

1,205,224. **Antiflare Device.** W. B. Koechlein, assignor of one-third to A. Morecraft and one-third to T. T. Staats, Boundbrook, N. J. Arrangement of reflectors.

1,205,244. **Signal Apparatus.** C. E. Mitchell, Stockton, Cal. Electromagnetically operated direction-indicator for automobiles.

1,205,248. **Printing-Telegraph Apparatus.** C. E. Nelson, assignor to Union Switch & Signal Co., Swissvale, Pa. Comprises key-controlled sunflower.

1,205,259. **Automatic Circuit-Closer.** H. Plymale, assignor of one-half to I. H. Pinkerman, West Huntington, W. Va. Float-controlled for regulating pump.

1,205,266. **Electrical Switch-Throwing Mechanism.** J. A. Ross, Altoona, Pa. Electromagnetic mechanism for throwing track switch-point.

1,205,281. **Compensating Device for Line Wires.** A. C. Sorensen, Webster, N. D. Block and tackle device with weight at rope end secures wire to pole.

1,205,283. **Automatic Signaling Device.** T. Stamatson, Brooklyn, N. Y. For automobiles, signal arms and lamp circuit controlled by pedal.

1,205,289. **Sparking Plug.** J. Z. Tucker and L. W. Markwort, St. Louis, Mo. Special structure having three electrodes.

1,205,308. **Face Shield.** E. L. Work, assignor of one-third to F. J. Williams and one-third to F. Armstrong, Columbus, O. Eye-guard for electric welders.

1,205,319. **Signal Box.** C. E. Beach and L. J. Voorhees, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Details of device having windable signaling train.

1,205,325. **Pyrometer.** E. L. Clark, assignor to National Carbon Co., Cleveland, O. Comprises a thermo-couple and galvanometer.

1,205,343. **Apparatus for Testing Dry-Cells.** J. H. Goodwin and F. A. Adamski, assignor to National Carbon Co., Cleveland, O. Timed contact mechanism.

1,205,348. **Circuit Maker and Breaker.** W. A. Hoeneman, Brooklyn, N. Y. Details of device comprising tiltable mercury chamber.

1,205,350. **Single-Wire Trolley.** G. A. Jillson and H. G. Andrews, assignors to H. P. Andrews and J. J. Worthington, Sacremento, Cal. To permit use of single wire for double-track road.

1,205,361. **Non-Glaring Headlight.** H. W. Lakin, Medford, Mass. Arrangement of casing, hood and reflector.

1,205,365. **Method and Apparatus for Wireless Telephony.** J. P. McCarthy, and K. Douglass, assignors to Universal Wireless Telephone & Telegraph Co., Los Angeles, Cal. Continuously produced oscillations have the radation suppressed by a circuit controlled by microphone.

1,205,374. **Ground-Connector.** I. Marcus, Winthrop, Mass. Clamp for connecting to pipes, etc.

1,205,377. **Electrode for Arc-Lamps.** W. R. Mott, assignor to National Carbon Co., Cleveland, O. Carbon and rare-earth tilanates.

1,205,380. **Combination Electric Lamp and Stove.** N. G. Nicoll, assignor to Rubes Electric Devices, Inc., New York, N. Y. Pedestal supports shade having electric heater adapted to receive a cooking utensil when inverted.

1,205,392. **Electric Battery.** L. R. Rhoades, Fremont, O., assignor to National Carbon Co. Waterproof of covering of zinc electrode forming container for battery.

1,205,422. **Spark-Plug.** C. F. Arnold, Watsonville, Cal. Special electrode structure.

1,205,427. **Descriptive Film Attachment and Synchronizing Mechanism.** J. W. Billings, Union, Iowa. Picture, film electrically controls a supplementary descriptive film.

1,205,434. **Electric Circuit-Controller.** R. Connell, Westfield, N. J. Movable contact member is moved in opposite directions by expansible chambers.

1,205,441. **Spark-Plug.** H. N. Eastman, assignor of one-half to E. A. Eastman, Dayton, O. Special manner of forming insulation.

1,205,448. **Test Bench.** E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. For brake-testing motors.

1,205,451. **Electric Control System.** N. Joleen, Chicago, Ill. Three-phase pump-motor circuit, controlled by current conditions and speed.

1,205,460. **Receiving Apparatus for Electric Telegraph and Electric Selective Systems.** W. J. Lyons, Dublin, Ireland. Operated only by receipt of complete signal of predetermined character.

1,205,462 and 1,205,463. **Railway-Train-Control System.** J. C. McDonald, New York, N. Y. First patent: Has block sectionalized train-control conductor with vehicle-controlled controller. Second patent: Above applied to electric road.

1,205,467. **Electric-Circuit Controller.** S. Mazur, assignor to C. Ahrhart, Jr., Buffalo, N. Y. Contact apparatus for attachment to clock to be controlled thereby.

1,205,469. **Apparatus for Space Transmission of Energy.** F. H. Millener, Omaha, Neb. Details of particular sending arrangement.

1,205,499. **Telephone Exchange System.** J. L. Wright, assignor to J. R. Garfield, Cleveland, O. Interconnection of manual and automatic exchanges.

1,205,511. Method of and Apparatus for Welding. H. E. Butcher, assignor to Standard Welding Co., Cleveland, O. For making tubing; weld is started by passing current and completed by igneous blast.

1,205,512. Method and Apparatus for Making Tubing. H. E. Butcher, assignor to Standard Welding Co. Machine for performing above.

1,205,517. Fire-Protection Systems. J. W. Cox, Erie, Pa. Has electric pump control and indicator system.

1,205,518. Telephone Exchange System. E. B. Craft and J. N. Reynolds, assignors to Western Electric Co., New York, N. Y. Manner of extending lines to operators' positions.

1,205,520. Selector Switch. H. F. Dobbin, assignor to Western Electric Co. Structural details.

1,205,523. Telephone Exchange System. B. G. Dunham, assignor to Western Electric Co. Special test arrangements.

1,205,530. Method of and Means for Translating Sounds. R. E. Hall, assignor of one-half to C. A. Robertson, Portland, Ore. Sounds amplified by impressing on a fluid jet which controls circuit.

1,205,536. Automatic Switch. G. H. Heydt, assignor to Western Electric Co. For telephone systems; structural details.

1,205,538. Telephone System. E. E. Hinrichsen, assignor to Western Electric Co. Trunking arrangements between exchanges.

1,205,549. Electric Switch. H. Kruesheld, Irvington, N. J. Details of rotary device.

1,205,569. Electrically Heated Chocolate-Table. H. W. Schwimmer, assignor to H. W. Schwimmer Co., Indianapolis, Ind. Structural details.

1,205,570. Method of and Apparatus for Electric Welding. F. L. Sessions, assignor to Standard Welding Co., Cleveland, O. Modification of No. 1,205,511.

1,205,571. Electric Heater. G. Sharpnack and T. J. Nash, assignors of one-half to G. P. Elmen, one-fourth to S. O. Salisbury and one-fourth to A. R. Talbot, Lincoln, Neb. Electrolytic type; immersion water-heater.

1,205,572. Winder for Spring Motors. W. G. Shelton, New York, N. Y. Circuit of winding motor is opened when motor is stalled.

1,205,576. Safety Razor. M. B. Stearns, Huntington Beach, Cal., and L. B. Stearns, Yuma, Ariz. Motor in handle reciprocates one blade in conjunction with a stationary blade.

1,205,589. Sectional Outlet-Box for Electric Conduits or Wires. L. J. Young, assignor to Allsteelequip Co., Aurora, Ill. Made up of a number of interlocked units. (See cut.)

1,205,617. Telephone Exchange System. C. L. Goodrum, assignor to Western Electric Co. Automatic.

1,205,618. Speech-Transmitting Mechanism. E. Grissinger, assignor to American Telephone & Telegraph Co., New York, N. Y. Telephone repeater.

1,205,620. Charging Storage Batteries. V. M. Harris, assignor to H. S. Hawley, Chicago, Ill. Method of charging from current having phase waves.

1,205,623. Lamp. E. A. Hawthorne, Bridgeport, Conn. Structure of headlight.

1,205,624. Switch. E. A. Hawthorne. Switch handle may either project outside casing or be made inaccessible by folding inside.

1,205,628. Portable Electric Light. G. F. Hitselberger, assignor to American Ever Ready Co., New York, N. Y. Details of switch in device simulating candle and stick.

1,205,629. Circuit-Controller for Portable Electric Lights. G. F. Hitselberger, assignor to National Carbon Co. Details of switch for tubular flashlight.

1,205,633. Portable Electric Light. C. Hubert, New York, N. Y. Simulates oil lantern.

1,205,645. Electric Battery Lamp. J. W. Lawhead, Wilmington, O. For attachment to dry cell.

1,205,646. Electromagnetic Bell. L. A. Littler, assignor to Autocall Co., Shelby, O. Details of gong.

1,205,647. Splice-Bar for Rail-Joints. C. G. McCaulley, Washington, D. C. Special insulation.

1,205,661. Controlling and Alarm Device. L. M. Plansoen, Garfield, N. J. For the guide-roller of a screen in a paper-making machine.

1,205,677. Inking Mechanism for Bulletin Printing Machine. K. A. Staahlgren, assignor to National Electric Bulletin Corporation, New York, N. Y. Telegraph printer.

1,205,682. Spark Intensifier. R. M. Sutherlin, Kansas City, Mo. Structural details of auxiliary spark-gap.

1,205,683. Attachment Plug and Receptacle. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. One-piece insulator structure.

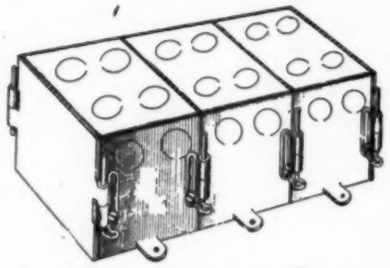
1,205,700. Selecting Device for Automatic or Semi-Automatic Telephone Systems. G. A. Betulander and N. G. Palmgren, assignors to Betulander Automatic Telephone Co., London, England. Non-numerical device.

1,205,725. Inclosed Arc Lamp. K. Ferber, assignor to Siemens-Schuckert-Werke G. M. B. H., Berlin, Germany. Arrangement of casing and chambers.

1,205,729. Pressure-Regulating Apparatus. R. L. Frink, Lancaster, O. Electrically controlled.

1,205,731. Relay. H. Gerdien, assignor to Siemens Halske A. G., Berlin, Germany. Resonance relay.

1,205,737. Incandescent Electric Lamp. F. Harrison and F. L. Harrison, Prestwick, Scotland. Arrangement of leading-in wires and filament support.



No. 1,205,589.—Sectional Outlet Box for Electric Conduits or Wires.

1,205,750. Motor Arc-Lamp. F. Kiesler, assignor to Siemens Schuckertwerke, G. M. B. H., Berlin, Germany. Carbons hammer upon one another in case of non-ignition of lamp.

1,205,767. Knockdown Electric Sign. C. H. Lush, Freeport, N. Y. Special structure having lighting hood.

1,205,770. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Magneto structure.

1,205,783. Telephone Pay-Station. C. E. Pratt, Chicago, Ill. Coin-controlled, spring-returnable mechanism.

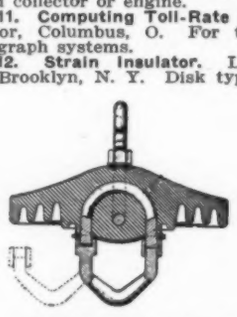
1,205,794. Automatic Train-Stop. A. P. Sanborn and R. C. Wilson, assignor of one-third to H. R. Horton, Haymount, Briarcliff Manor, N. Y. Arrangement of service and emergency solenoids controlling rotary air valve.

1,295,798. Distress Signal. M. Scholder, New York, N. Y. Actuator for push-button locks it closed after operation.

1,205,799. Automatic Train-Stop. E. H. Schults, Everett, Wash. Cut-off of locomotive steam controlled through trolley wire and collector or engine.

1,205,811. Computing Toll-Rate Map. H. B. Taylor, Columbus, O. For telephone and telegraph systems.

1,205,812. Strain Insulator. L. Steinberger, Brooklyn, N. Y. Disk type. (See cut.)



No. 1,205,812.—Strain Insulator.

1,205,814. Automatic Car-Stop. A. Taurman, Richmond, Va. Electromagnetically controlled switch converts driving motor into braking generator.

1,205,824. Lamp for Motor Vehicles. C. F. Ulrich, Holbrook, N. Y. Circuit maker and breaker for headlight circuit.

1,205,878. Terminal Connector. A. H. Fargo, Poughkeepsie, N. Y. Has a body portion formed of a tube with a wedging sleeve for securing the conductor therein.

1,205,916. Illuminating Apparatus. E. F. Meador, Danville, Va. Headlight structure.

1,205,929. Alarm for Incubators. J. F. Poore, Waco, Tex. Thermostatically controlled make-and-break mechanism.

1,205,937. Synchronous Motor. L. Rouzet, Levallois Perret, France. Single-phase motor of the repulsion type.

1,205,940. Machine for Making Battery Jars. W. W. Weitling, assignor to American Hard Rubber Co., New York, N. Y. Makes hard-rubber jars.

1,205,943. Automatic Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement for connecting in substation line.

PATENTS EXPIRED.

The following United States electrical patents expired on November 28:

637,766. Means for Driving Dynamos from Car Axles. J. L. Creveling, New York, N. Y.

637,773. Constant-Current Transformers. R. Fleming, Lynn, Mass.

637,779. Electromagnetic Instrument. G. E. L. Grabe, Berlin, Germany.

637,785. Protecting Static Voltmeters. E. M. Hewlett, Schenectady, N. Y.

637,789. Combined Relay and Distributer. K. Himrod, Chicago and J. R. Tucker and C. C. Hinckley, Aurora, Ill.

637,794. Lightning Arrester. T. B. Hughes, Hawes Crossroads, Tenn.

637,819. System of Distributing Alternating Currents. E. G. P. Oelschlager, Westend, Germany.

637,825. Arc Lamp. I. R. Prentiss, Schenectady, N. Y.

637,828. System of Electrical Distribution. E. B. W. Reichel, Berlin, Germany.

637,846. Electrical and Selective Signaling. J. A. Barrett, Summit, N. J.

637,873. Apparatus for Indicating Direction of Rotation of Motors. H. Kahler, Hamburg, Germany.

637,884. Telephone Circuit. J. J. Moller, Kiel, Germany.

637,886. Electric Arc Lamp. G. L. Moyer, Hartford, Conn.

637,890. Electrical Cutout. C. G. Perkins, Hartford, Conn.

637,891. Fusible Plug. C. G. Perkins, Hartford, Conn.

637,892. Electric Switch. C. G. Perkins, Hartford, Conn.

637,894. Terminal-Head Box. H. E. Procunier, Chicago, Ill.

637,905. Changeable Electric-Light Sign. H. Tripp and G. E. Stephenson, Chicago, Ill.

637,914. Electric-Alarm System and Apparatus for Testing Same. H. F. Woodman, Boston, Mass.

637,960. Electrically Operated Swich Mechanism. S. L. Foster, San Francisco, Cal.

637,979. Incandescent Electric Light and Process of Making Same. W. L. Voelker, London, England.

637,992. Electric Log Recorder. L. T. Jones, Jr., San Francisco, Cal.

638,011. Electric Meter. E. S. Halsey, Evanston, Ill.

638,026. Automatic Block Signal and Train-Stopping Device. S. J. McCart, Appleton, Wis.

638,036. Electric Switch. H. P. White, Philadelphia, Pa.

638,038. Primary Battery. H. Blumenberg, Jr., and F. C. Overbury, New York, N. Y.

638,039, 638,040, 638,041 and 638,042. Battery Compound. H. Blumenberg, Jr., New York, N. Y.

638,050. Electric Heater. E. E. Gold, New York, N. Y.

638,055. Oscillating Meter. A. Lotz, Berlin, Germany.

638,070. Dynamoelectric Machine. W. B. Sayers, Bearsden, Scotland.

638,083. Chemical Generator of Electricity. E. L. Anderson, St. Louis, Mo.

638,084. Electrical Cut-Out Apparatus. L. Andrews, Hastings, England.

638,085. System of Electrical Distribution. L. Andrews, Hastings, England.

638,101. Telegraph Instrument. J. L. Cutler, Cincinnati, O.

638,110. Starting Switch. J. W. Gibbs, Liverpool, England.

638,125. Electric Arc Lamp. W. C. Johnson and A. Wunderlich, London, England.

638,148. Electric Belt. A. T. Sanden, New York, N. Y.

638,150. Means for Controlling Electrically Moved Apparatus. G. E. Sautter, Paris, France.

638,152. Telephony. J. S. Stone, Boston, Mass.

638,155. Electric Railway. E. Warwick, Chicago, Ill.

638,157. System of Electrical Distribution. E. Wilson and J. M. Cater, London, England.

638,159. Carbon-Holder for Electric Arc Lamps. F. S. Worsley, London, England.

638,160. Electric Clock. H. E. Anderson, Stockholm, Sweden.

638,170. Illuminated Car-Sign. G. E. Bostwick, New York, N. Y.

638,186. Surface-Contact Electric Railway. D. Robertson, Jr., Uddingston, Scotland.

638,199. Electric Switch. F. A. Merrick, Johnstown, Pa.

Design 31,898. Electromotor Casing. J. Post, New York, N. Y.